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CHAPTERS

ON THE

COMMON THINGS OF THE SEA-COAST.

BY ANNE PRATT.

PUBLISHED UNDER THE DIRECTION OF
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PREFACE.

THE main object of this little book is to enable the reader, unacquainted with Natural History, to recognise some of the different objects frequent on our shores. There is not one of them all, but has some interesting circumstance connected with it, familiar enough to the man of science, but never suspected by those who have not had opportunity or inclination to study them. Could we trace the mental history of our great naturalists, we should find that many who have devoted their lives to the pursuits of science, had at first their attention directed to it, like Linnæus, by listening to a conversation, or, like Sir Joseph Banks, by musing, in a leisure moment, on the beauty of a flower; and thus the reading of a little volume like this, on common things, may serve to awaken an interest in nature, which shall not sleep again.

In so small a book little reference could be made to any system of classification; and though the alphabet of science is as important as the alphabet of literature to any who would make progress in it, yet the use of scientific terms would here be out of place. Perchance the reader may be led to investigate more fully the subjects here presented; and this book will have well accomplished its design, if it should create a desire to study the works of our great naturalists, of Dr. Harvey, or Dr. Johnston, of Professor Forbes, or Rymer Jones, or other writers here so often referred to; or if it should send him into the wide fields of nature to observe and discover for himself.

But should time and place be wanting to pursue the subject farther, yet will he have gained something, if he have learned aught of common things. "Partial knowledge," says an Arabian proverb, "is better than total ignorance. He who cannot acquire all that he would, should be careful to get all that he can."

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Blennius Phalæna. a little fish c. brilliant, scarlet fins, & tail spot, & the many tints in y. body. Gallbraith. et Ull. Sept. 22, '58.

SEA-SIDE PLANTS.

CHAPTER I.

"For there, by sea-dews nursed and airs marine,
The Chelidonium blows in glaucous green;
Each refluent tide the thorn'd Eryngium laves,
And its pale leaves seem tinctured by the waves;
And half way up the cliff, whose rugged brow
Hangs o'er the ever-toiling surge below,
Springs the light Tamarisk; the summit bare
Is tufted by the Statice; and there,
Crush'd by the fisher, as he stands to mark
Some distant signal or approaching bark,
The Saltwort's starry stalks are thickly sown,
Like humble worth, unheeded and unknown."

It is delightful on some fine summer's morning to wake up to the loud continuous sounds of the waves, and to stray along the shore, with eye and heart alive to the natural beauty of this world. When the calm airs seem, as the poet describes them,

"Like Music slumbering on its instrument,"

they are to the listener both sweet and soothing, and serve—we know not how nor why—to awaken memories of the past, and so to identify themselves with our own being, that scenes far away, and long absent friends, gradually mingle in the day-dreams begotten by their tones.

The glorious ocean! Can we wonder that lingering groups gather daily close by its boundaries, gazing hour after hour upon the silver waves? Call them not idlers. They may have come from scenes of busy toil for needful repose, and while listening to sweet sounds, and looking on lovely objects, they are getting treasures of memory for other days, and store of health and strength for future duty.

What thoughtful person ever listened to the ocean's murmurs without thinking over what a mass of contents its waters roll:—

> "Bones of dead men, that made
> A hidden Golgotha where they had fall'n,
> Unseen, unsepulchred, but not unwept
> By lover, friend, relation far away,
> Long waiting their return to home and country,
> And going down into their fathers' graves,
> With their grey hairs or youthful locks, in sorrow,
> To meet no more till seas give up their dead;
> Some, too,—ay, thousands,—whom no living mourn'd,
> None miss'd, waifs in the universe, the last
> Lorn links of kindred chains for ever sunder'd."

We have often thought, on looking on the multitudes of invalids who with their companions crowd our shores in summer, that they would possess a great advantage if they had some out-door pursuit with which to beguile the time. Dr. Cullen used to say, that he had cured weak stomachs by engaging his patients in the study of botany, and particularly in the investigation of wild plants; and many a head-ache, and a heart-ache too, would be relieved if its owner could be brought to feel an interest in the shells or sea-weeds which are strewed on the beach, or in the sweet wild blossom which smiles on the side of

the cliff. But the time spent at the sea-side is not usually the time for study. Rest of mind is often absolutely necessary for health; and even where this is not the case, yet the many hours spent in the open air, while invigorating to the frame, render us indisposed to any continued mental exertion. It is those already in some degree acquainted with natural history, who can now enjoy its results. There are few, however, who, while for a period they are residents on our coasts, would not be glad to know some of its familiar objects, if the knowledge could be obtained without study; and it is for the unlearned in these matters that these pages are written.

It will be necessary to confine our remarks on the plants of our shores to such as grow only by the sea-side, or to such as grow more frequently there than elsewhere. The flowers which cluster in some of the meadows at a little distance, and many which spring up on the cliffs, thrive equally well on inland soils of the same nature. The rich clumps of the wild rock rose (*Helianthemum vulgare*) are as bright on the chalky cliff which skirts the green lane, as on those that lie about the sea; and, find them where we may, have so bright a golden tint, that we remember how Pliny told of them, that the kings and wise men of Persia anointed themselves with them, to make them fair and beautiful, and called them the "beauties of the sun." Then there is the wild thyme (*Thymus serpyllum*), sending its sweetness from among the short grass on the cliff, or on the air of the heathland; and the pale chocolate blossoms of the wild marjoram (*Origanum vulgare*), which the Greeks termed the "joy of the moun-

tain;" and the pretty little euphrasy, or eye-bright (*Euphrasia officinalis*), which grows equally well on the pasture land far away from the sea, and which in the Greek language signified "delight;" and many another, with old names so expressive, and so pretty withal, that we are reminded of the words said to be spoken by Mary Powell, before she married John Milton, that "Adam might have named the animals, but that Eve surely named the flowers."

Notwithstanding considerable variety in the aspect of different parts of our coast, yet every one must have remarked the general barrenness of vegetation in the immediate vicinity of the sea. Such trees as are planted near the shore, have usually a stunted appearance, and have their upper boughs bent down by the strong winds which blow over them. The sycamore is the only tree which can be said to flourish close to the sea as well as on inland spots, and to lift as bold a front and as full a canopy to the sea breeze, as to the wind of the sheltered valley; and the tamarisk and the tree mallow are almost the only shrubs which seem to prefer the saline soil for their growth. The presence of a large quantity of salt in the soil, has, from the earliest ages of the world, been known to produce sterility; and not only do the early Greek and Roman writers name the practice of sowing a field with salt when they condemned it to barrenness, but we have an instance of this named in the Scriptures, when Abimelech in his fury beat down the city of Shechem, and sowed its site with salt, that nevermore the earth should yield her produce to gladden the heart of man. The Psalmist, speaking of

some once beautiful country, says, "He turneth the land into barrenness," literally, "into saltness;" and the scanty herbage and the small number of trees and flowers usually found on the vast saline deserts of Africa, or the sandy regions of the countries of the East, are proofs at once of the injury done to vegetation by salt. On some lands of Cheshire, even of late years, when a soil has produced too abundantly the rushes and weeds which trouble the agriculturist, he has laid rock salt upon the earth to destroy them.

But it is only lands very near the sea whose produce is injuriously affected either by the muriates of the atmosphere which have passed over it, or by the saltness existing in the earth. A portion of salt is favourable to the growth of plants, and the supply of moisture derived from so large a body of water renders the land at a small distance more fertile than those parts of the earth's surface which are further from the coast. Every one at all acquainted with the southern part, especially, of our island, can call to mind some quiet nooks of sunshine in which the wild flowers attain great size and beauty, and crowd the hedgebank or meadow, only just screened by a cliff from the rudest breezes of the sea. What Keats said of the Isle of Wight, might equally well apply to some parts of the coast of Devonshire: "I have found," said the invalid poet, "several delightful wood alleys, and copses, and quiet freshes; as for primroses, the isle ought to be called Primrose Island—that is, if the nation of cowslips agree thereto, of which there are divers clans just beginning to lift up their heads."

But, barren as the soil is close to the sea, yet it

has its own peculiar plants; plants which will grow nowhere else—saline plants, which, if carried away to grace some inland garden, droop and pine for their native shore. Others grow not only by the sea-side, but on pasture lands to which saline waters have access; and some which grow in our inland fields, yet are so much more luxuriant near the shore, that we must consider that as at least an especial place of their growth. So small, however, is the number of wild plants of the sea side, that limited as is this little volume, they can be enumerated in the chapter appropriated to them.

There are few subjects more interesting to the botanist than the adaptation of plants to their peculiar places of growth. The most lofty Alpine hills have their blossoms, and the deep blue gentian thrives amid the snows,

> "The living flower that skirts the eternal frost;"

the sand has its sand-worts, which refuse to grow on richer soils. The magnificent cedar is wild on its native Lebanon only; Lapland boasts her flower called Charles's Sceptre, which is never seen beyond the limits of her own land. Even the dreary Siberia has her own beautiful Cypripedium, or, as we in English term it, the ladies' slipper. Our streams have their water-lilies, our meadows their field flowers, our woods their anemones and hyacinths. At the extreme limits of vegetation we find the wood sorrel, ferns, lichens, and mosses cover the grey rocks; one lichen growing even on the forbidding surface of the stalactite. There are plants which are indigenous to sulphureous springs, and a little flower

grows in luxuriance on the refuse of the lead mine. The sea itself has on its bed immense tribes of marine vegetation, the food and home of its living creatures; and where but in the sound of its waves shall we find that bright flower of our sand and shingle, the yellow horned poppy?

There are some features in our wild saline plants which, while they are not invariable or peculiar to them, yet are very general. They are usually very succulent, and their stems and foliage have on them more or less of a sea-green powder,—a kind of pale green or whitish bloom. Leaves or stems covered with this are termed by botanists glaucous, and a very familiar instance of glaucous foliage may be seen in the outer leaves of the common cabbage. The succulent nature of sea-side plants renders them suitable for soils which yield little nourishment; for succulent plants have many pores, by means of which they readily imbibe moisture, which is long retained in their juices, and which, deriving as they do from rains or dews, renders them less dependent on nutriment to be obtained from the root. The common houseleek and stonecrop of our house-tops are nourished far more by the atmosphere than by the soil; and so are the aloe and the fig marigold, and the ice plant of desert lands, many of which are like the plants of our sea-side, too, in the glaucous nature of their green.

One of our sea-side plants, the Samphire (*Crithmum maritimum*), is known, at least by name, to most persons. Several of our early poets have alluded to it, and its frequent use as a pickle renders it familiar to many. Not one of our native plants can yield so good, and warm, and aromatic

a flavour for a pickle as this; and it has been a favourite with good housewives for many years; for an old song of Heywood's, enumerating the cries of London in his time, has this line,—

"I ha' rock samphier, rock samphier."

The inhabitants of places whose rocks abound with this plant use it not only as a pickle, but also as an ingredient in salads; and they also eat it as a culinary vegetable. It is sometimes grown in gardens and pots, and it appears under certain circumstances to thrive well. Thus Braddick, the horticulturist, who cultivated the samphire in Thames Ditton, on a sheltered and dry spot, well screened from the morning sun, and who sprinkled the soil where it grew with powdered barilla, remarks of it, "This I do to furnish the plant with a supply of soda, since, in its native place of growth, it possesses the power of decomposing sea-water, from which it takes the fossil alkali, and rejects the muriatic acid." This horticulturist also protected it from the cold of winter, and he found that by this mode of treatment the plants flourished most plentifully, and produced a large supply of leaves and shoots, which were cut twice in the season.

The stem of the samphire is about a foot high, round and leafy; and it has dense clusters of greenish-white flowers. The whole plant is fleshy and glaucous, with a salt aromatic flavour. It grows on several rocky shores of our southern coast, but it is not common in the north of England. It is very rare on the rocks of Scotland; and Sir William Hooker remarks of it,—"It is found only, I believe, on the coast of Galloway, and thence northward to Colzean Castle, Ayrshire

(whence I have received numerous specimens), and at Aberlady, Haddingtonshire." He adds, that when the process of drying this plant for the Herbarium is aided by immersion in hot water, a number of opaque white dots make their appearance on the surface.

The samphire is always found on rocks or stone walls beyond the reach of the tide. The chalk hills of Dovor, which gave its old name to that ancient town, the Dwyr of the Saxons, from their "Dwfyrrha," a "steep place," have long been celebrated for the growth of samphire. Michael Drayton refers to it in his Poly-Olbion:—

> "Some, his ill-season'd mouth that rightly understood,
> Rob Dover's neighbouring cleeves of samphyre, to excite
> His dull and sickly taste, and stir up appetite."

And the very name of the Shakspeare Cliff was derived from its connexion with the passage in which the great dramatist refers to this plant. That cliff has recently suffered from the long-continued action of rain and sunshine upon it; but as long as it exists, the samphire will probably continue to thrive there. We must quote again the oft-quoted lines on this subject, and which, indeed, well describe the scene from the summit of the cliff:—

> "How fearful,
> And dizzy 'tis to cast one's eyes so low!
> The crows and choughs that wing the midway air
> Show scarce so gross as beetles; half-way down
> Hangs one that gathers samphire,—dreadful trade;
> Methinks he seems no bigger than his head;
> The fishermen that walk upon the beach
> Appear like mice, and yon tall anchoring bark
> Diminish'd to her cock, her cock a buoy,
> Almost too small for sight: the murm'ring surge,
> That on the unnumber'd idle pebbles chafes,

> Cannot be heard so high. I'll look no more,
> Lest my brain turn, and the deficient sight
> Topple down headlong."

This trade of samphire gathering from the cliff has indeed proved a dangerous one. A few years since, a man, resident in Dovor, and who had for many summers gathered the plant for sale in the neighbourhood, was suspended, as usual, by a rope attached to a pole at the summit. The rope, on this occasion, suddenly gave way, and the unfortunate man was precipitated to the base of the cliff, and expired immediately.

The word Samphire is a corruption of St. Pierre, the plant having, in former times, been dedicated to the memory of the Apostle; and it was also familiarly called St. Peter's Herb. It had, besides, the name of Crest Marine. The monks, as we well know, gave the names of the wild plants known to them, according to the times when they came into blossom, making them the remembrancers of their saints' days and festivals. Upwards of three hundred plants, now in use, and recorded in our works of medical botany, under different names, were known in years long passed away in the monasteries, as the medicinal herbs used by the religious orders. A writer in Rees's Encyclopædia says that we ought to pronounce and spell the name of this plant sampire, our modern orthography and pronunciation being a corruption of this. But our quotations from the old writers serve to show that various modes of spelling the word were used in past times; nor indeed need we wonder at this, when even in the days of Queen Elizabeth a man would spell his own name half a dozen ways if it could possibly bear such a variety

of modes of orthography. The word samphier, as Heywood spells it, seems to give the nearest similarity in sound to its original derivation.

Crabbe, who resided at a part of our coast where vegetation is peculiarly barren, refers to this plant, as well as to one mentioned afterwards, the saltwort. His pictures of sea-shore scenery are always mournful and dreary, nor is this description of the salt river-side less so:—

> "With ceaseless motion comes and goes the tide;
> Flowing, it fills the channel vast and wide;
> Then back to sea, with strong majestic sweep,
> It rolls in ebb, yet terrible and deep:
> Here sampire banks and saltwort bound the flood;
> There stalks of sea-weed withering in the mud;
> And higher up, a ridge of all things base,
> Which some strong tide has roll'd upon the place."

The samphire is found also on the rocky shores of other countries, as in Italy, Spain, and France, and is used there, as with us, as an article of food and luxury.

Somewhat similar to this plant, and commonly known as the annual samphire, is the jointed glasswort (*Salicornia herbacea*), so abundant on the salt marshes near our coast, or on muddy shores occasionally overflowed by the tide. It is a leafless herb, of pale bright green, and much succulence, and it flowers in August and September. The poor people who reside in the neighbourhood of these marshes gather this plant, and sell it for the purpose of pickling; and, assisted by strongly flavoured spices, it is certainly as good a herb for a pickle as many another one commonly used; but the aromatic flavour of the real samphire is wanting in this plant, whose juices have in themselves only a saltish mawkish flavour. Those who know

the real samphire are not likely to purchase this; and similar as it is in general appearance, it differs much in its flowers, which consist of dense spikes, jointed like the stem, and bearing at the base of every articulation, on two opposite sides, a cluster of three little blossoms. It was formerly called jointed glasswort, crabbe grasse, and frog grasse, and we now frequently hear it termed marsh samphire, to distinguish it from the rock plant. Its saltish taste renders it very agreeable to animals, and it is one of the plants which, on our saline soils, prove so beneficial to cattle, that they are often sent there by their owners to regain lost flesh and strength. Most animals enjoy feeding on this kind of herbage, as the whole of it must be more or less impregnated with salt, and it is not unlikely that the sea air has upon the frame of the inferior animals the same invigorating effect which it has upon the constitution of man.

This glasswort, as well as several other species, abounds on the shores of the Mediterranean, and they are all included under the name of *Erba-cali*, by the Italians, while the German name of glass-schmaltz, like our glasswort, is significant of the uses of these plants in Germany. In the south of Europe, as well as in northern Africa, this salicornia was burnt for the soda which its ashes contain; and this material was much in use by the soap and glass manufacturer of these countries. At Marseilles, especially, a great quantity was gathered from the sea-shores for the purpose of burning for soda. We have another British species, called the creeping-glasswort (*Salicornia radicans*), which is very much like the former kind, only that it is more branching and strag-

gling; and it is distinguished by having a perennial stem, which, at the lower part, is quite woody, and about a foot long. It grows sometimes on the edge of a low muddy bank depending from thence; but it is a rare plant. It has been found in the Isle of Sheppey, in Kent, and also on the Norfolk and Sussex coasts. The botanic name of the genus, taken from salt and a horn, is very expressive of the nature and form of the plants.

But the abundance of soda yielded by several sea-side vegetables is in none greater than in the genus of plants called *Salsola*, by botanists, one of which is the prickly-saltwort of our shores. These plants, like the samphire and marsh samphire, are pickled with vinegar and eaten at table. The various uses of soda have rendered some species of this genus of considerable importance; and our only native kind was once much valued for the alkaline salts yielded by its ashes. Carbonate of soda has, however, of late years, been obtained from common and rock salt, so that the impure soda once procured from sea-weeds, and called kelp, and the more valuable barilla yielded by the soda plants, are no longer in request in this country. The prickly saltwort (*Salsola Kali*) is a spreading plant, with awl-shaped leaves, tipped with spines, and an angular stem with pale greenish flowers growing close down upon it. It blossoms in July, and grows very generally among the sands of the shore. This species is not a native of our coasts only, but is plentiful on most sandy shores in all parts of the world, and its value in producing soda is very generally known. The species of saltwort called the round-leaved saltwort (*Salsola sativa*) was cultivated very extensively in southern Europe,

sionally found on the southern coast of England, and is said to have grown both in Norfolk and in Portland Island; but most botanists doubt if this is a truly British flower, though De Candolle thinks it is a variety of our common yellow species. It is a remarkably elegant blossom, the petals being of richest scarlet, and having a black spot at the base of each.

The genus was once called Chelidonium, and the yellow horned species is referred to, under that name, in the lines which stand at the head of this chapter. Several botanists have said that this flower possesses an acrid copper-coloured juice, which causes madness. The writer of these pages has, however, examined many specimens, and found only a colourless juice. It is certainly of a most acrimonious description; so much so, that on applying to the tongue the finger which had touched the broken stem, a sensation of burning was produced in the mouth and throat, which remained for an hour afterwards. Ben Jonson mentions the yellow horned poppy as one of the flowers used by pretended witches and magicians in their incantations. That the practice of burning herbs accompanied that of the magical art, there is no doubt; and it is equally evident that such plants were selected as were likely, while burning, to produce fumes of such a nature as to affect the nervous system, so as to deceive the imaginations of persons subjected to their influence. Various plants of narcotic and stupifying properties also were administered internally, just as the poor Kamschatdales, when preparing themselves for the service of their gods, are accustomed to produce a kind of intoxication by eating their native plant,

the cow-parsley, by means of which they experience a wild delirium of feeling. If the juices of our yellow horned poppy cause madness, then it seems likely that this was one of the herbs used in the times of superstition; and now that those dark practices have passed away, no record save the poet's song remains of this its former use in our land.

Though not quite so common a flower as the yellow horned poppy, the sea-side Eryngo is a

SEA ERYNGO (*Eryngium maritimum*).

well-known ornament of some maritime spots, and in many parts of the eastern shores of England it is abundant. The Rev. W. R. Drummond has well described it:—

"The Eryngo here
Sits as a queen among the scanty tribes
Of vegetable race. Around her neck
A gorgeous ruff of leaves, with snowy points,
Averts all rough intrusion. On her brow
She binds a crown of amethystine hue,
Bristling with spicula, thick interwove
With clustering florets, whose light anthers dance
In the fresh breeze like tiny topaz gems.
Here the sweet rose would die. But she imbibes
From arid sands, and salt sea dew-drops, strength.
The native of the beach, by nature formed
To dwell among the ruder elements."

The sea eryngo (*Eryngium maritimum*) has a stem about a foot high, much branched, with prickly strongly-veined leaves, resembling the foliage of the holly, and dense heads of blue flowers. This flower flourishes too on the coasts of Ireland and Scotland; and travellers tell us that it grows equally well along the European and African shores of the Mediterranean. It is known on the several parts of our coast by a variety of names, as the sea hulver, sea holly, and sea holme. Our common prickly holly formerly bore also the names of hulver and holme, as well as that of scarlet oak, and the general resemblance of a branch of this plant to the holly bough, naturally led to its familiar names. Not that the reader must expect any similarity between the delicate waxen-like flowers of our evergreen tree, and the blossom of the eryngo; for this is more like our wild thistle flower, and so much so, that the author has heard children on the coast call the plant the blue sea thistle. The roots of the eryngo were

formerly candied and sold by confectioners as a sweetmeat, and though they have lost their old renown for their strengthening and stimulating virtues, and no modern poet like those of older days sings their praises, yet there are persons who still sell the candied eryngo roots in London, though they have not so many purchasers as in the days of Queen Elizabeth. There existed till lately, and probably exists still, in the town of Colchester in Essex, an establishment where these roots are prepared, and it was in this very town that these candied comfits first originated. More than two centuries since, an apothecary named Robert Buxton, who had a high idea of their medicinal properties, prepared the root in this way for general use. These plants grow on the sandy soils of Arabia, and the Arabs regard them as an excellent restorative. The use of plants as medicine was known long before men thought of seeking remedies among metallic or mineral drugs, and in Boerhave's time this plant was not only recommended by him, as a tonic, but seems to have been for many years generally so regarded. Linnæus says that the young flowering shoots are eaten in Sweden, boiled as asparagus, and describes them as a good vegetable. The young shoots of several of our wild plants are equally good for this purpose, and none are better than those of the wild burdock, which may be known by its very large leaves, purple thistle-shaped blossoms, and above all by the spiny flower-cups which children call burrs. It grows by most waysides.

We have but two species of eryngo, and the other (*Eryngium campestre*) is rare, though found occasionally in sandy fields: it is more bushy and slender

than the sea-side kind, and was found originally in Ray's time truly wild in England near Plymouth, where it still grows. It has also been seen on some spots near the sea at the north of England, but it has probably been introduced there in ballast. Throughout Italy, France, and Flanders it is a most common flower, and so general are the eryngos in North America, that nearly one hundred species have been described as growing wild, and one is in so frequent use as a medicine, for the relief of hysterical complaints, as to have acquired the familiar name of Fit-weed.

But, quitting for awhile the velvet-like sands which border our sea, we must in imagination linger by the cliffs near them. Tall venerable cliffs are they, on whose brow time seems to have written no changes, and which might give to England its name of Albion, as well as they did in days of yore. They have their own peculiar herbage, besides being decked by the milkwort, and the rest-harrow, and the beautiful yellow chlora, plants of the chalk soil everywhere throughout our land. All up their sides we see the green patch here and there,—

> "And down their slanted glory move
> Scents from the flowers that grow above."

One of the plants which is not wild elsewhere, is the sea-side cabbage, or cliff cabbage, as it is sometimes called; the *Brassica oleracea* of the botanist. It is not a common plant, though in some places very abundant. On the cliffs of Dover, as well as on some portions of the beach, it is plentiful, and growing up beyond the reach of the waves, yet requiring the saline air for its production, the clumps of this plant, with its glaucous green leaves,

give a peculiar tint and character to the vegetation of the spot. It is sufficiently like the young

SEA CABBAGE *(Brassica oleracea).*

cabbage-plant of the kitchen garden to be recognised at once: but few who look upon its bluish small scattered leaves and handsome pale yellow flowers, much like the wild mustard or charlock, are aware that to this sea colewort we owe all the kinds of cultivated cabbage, the leaves and flowers of which are eaten at our tables: and that red and white cabbage, and the giant cow-cabbage, and

the delicate brocoli, had so humble an origin, not to exclude that familiar vegetable, of which Dr. Johnson most unsentimentally declared, "Of all the flowers of the garden, I like the cauliflower." The Doctor should have lived at Tarragona, where the cauliflower is said to reach the enormous weight of forty pounds. No instance exists in which a vegetable is so altered by culture from its original condition. Our kitchen-gardens, with their compact cabbages, their Brussels sprouts and Savoys, indicate this; but this is little compared to the tall Cæsarean cow-cabbage, which from its arborescent nature is called the tree-kale, and which in La Vendée is said to be sixteen feet high; while one of its varieties, the palm-kale, is commonly ten or twelve feet in height, with a heart sweet and tender enough to fit it for the food of man, and leaves which furnish a plentiful nutriment for animals. Our cliff cabbage is frequently gathered from the heights in the neighbourhood where it is abundant, and is said to be a good boiled vegetable, but its uncooked leaves are very bitter to the taste. It was very early cultivated; indeed, from time immemorial some of its numerous varieties have been valued, though the common variety with a close compact heart, peculiarly called cabbage, was for some years imported from Holland into this country. Sir Anthony Ashley first cultivated it in England: but it was more than a century before its culture became so general as to render importation from Holland unnecessary. This grower of our esculent plant is said to have had a cabbage sculptured on his monument at Wimborne St. Giles, in Dorsetshire, in memory of this service rendered to his country.

The kale or colewort of the gardener, is another variety of this sea-side cabbage. Of this kind is made the *sauerkraut* of the Germans, and it is probable that several varieties were formerly included in this name, as kale is mentioned among the oldest English records, and the Saxon name for our month of February, when leaves begin again to clothe the ground, was Sprout-Kale. It is at this season that the sprouts from the old cabbage-stalks become fit for use, and hence their name for the month. The brassica was cultivated by the Romans, and also by the ancient Germans from very remote periods, and this, the botanic name of the genus, seems to have been derived from the Celtic word *Bresic*, a cabbage.

The flowers of the cabbage are of the form termed by botanists cruciferous, and are shaped like a cross, as in the single stock or wall-flower of the garden. This is a numerous family of plants, and to it belong a very large number of our esculent vegetables, as the turnip, the cresses, the radishes, and many of our wild and garden flowers, as the stocks, and rockets, and alyssums. Plants of this tribe universally possess stimulant qualities, combined with an acrid flavour; and none of the family are poisonous. The roots, leaves, stems, and buds of many of these plants are used as food; and in all cases their seeds abound in a fixed oil, which is expressed from some species for various economical purposes. They may always be known by the shape of their flowers; and they are more numerous in Europe than in either of the other great divisions of the globe. In our own land some of their number are to be found in almost every field.

Among the clefts of the rocks we may, in the months of July and August, see the tufted pink blossoms of the common Thrift, or sea Gillyflower (*Statice armeria*), called by the French, Spanish turf, and by the Italians, Ladies' pins; while our old English writers term it Ladies' cushions, and sea grass. We have the name of *Statice* from the Greeks, but they probably applied it to another plant. It signified to stop or arrest, and is now appropriated to an extensive genus, whose wiry and entangled stems seem well formed to stop the hasty footstep of the passenger over the cliff, or sandy ground, or muddy shore, where they grow. But the familiar names of our wild flowers—those by which they are known in country places—are often expressive of some hue, or form, or supposed virtue, or they tell a tale of spots where they grow; and the old name of thrift is a good one for the common plant of our sea shore, for it needs no rich soil, but grows on loftiest mountains and on boggy shores, and in crevices of maritime rocks, throughout Europe, as well as in North America. Lightfoot well designates it "the most humble and most lofty of plants." On some of the highest of the Scottish mountains this little flower rears its head, and Balfour says that he has gathered it from the summit of Muich Dhui, a mountain only second in height to Ben Nevis. It has been proved that this, and some similar plants, differ in their constituents according to the situations in which they grow. When adorning the sea shore, they contain salts of soda and iodine; but when they grow inland they lose the iodine, and exchange soda for potash. We have all seen the pink tufts and grass-like leaves of the thrift growing around the city

garden, and even the smoke of London seems scarcely to hurt its hardy little flowers. Though generally pink, yet in Cornwall it is often of a pure white colour. Its roots, cut in slices and boiled in milk, are said by Neill to have been formerly highly valued in the Orkneys as a cure for pulmonary consumption.

The Sea Lavender, or Lavender Thrift (*Statice limonium*), though a flower quite unlike, in general appearance, to the sea gillyflower, belongs to the same genus of plants; but this never grows on the

SPIKED THRIFT (*Statice spathulata*), AND COMMON THRIFT (*Statice armeria*).

rocky height, but blooms during July and August, in salt marshes and on muddy shores. It has flat bunches of close spikes of lavender-coloured flowers, which, however, have not the perfume of the garden lavender, and large, thick, leathery leaves, about five or six inches high. It is called the spreading spiked thrift, to distinguish it from a third species which grows on some parts of the sea-shore of Kent, at Whitehaven, on the Mull of Galloway, and on some other spots, both of England and Ireland; but it is not, like the other species, a common plant. This is the Upright Spiked Thrift (*Statice spathulata*), which has more slender branches of flowers, and blossoms in August. Both the last species and this are rare in Scotland, and rare in every part of the United Kingdom is the plant called Matted Thrift (*Statice reticulata*), which has small, crowded, purplish-blue flowers, and grows on the sea-shore at Norfolk. They have all scentless blossoms, and leaves somewhat succulent and of saltish flavour, but are very pretty plants; and they retain so much of their beauty when dried, that they do well to mingle with the groups of grasses which sometimes ornament the chimney-piece.

We do not find rich green meadows growing down close by the sea-side, but the short grasses which cover the cliffs or downs open to the sea breezes, have among them many lovely little flowers; and we can enjoy the music of the waves, when amid our summer rambles we come upon such a spot as Miss Barrett describes:—

> "A nook that openeth unto
> The glorious ocean's stedfast view,
> Being most closely shut from all
> Its kindred earth's sweet pastoral!

And yet its banks too smooth and steep
To be o'erbrowsed by the sheep,
Withal are slanted very greenly;
And flowers and grasses so serenely
Grow up them, that I ween the sea
Whereto their dewed faces be,
Doth serve them for another sky,
As warm and blue as that on high."

We have no marine grasses, yet we have some essentially maritime, and others peculiar to sandy districts,—grasses which are so valuable to our shores, that we should be unwilling to look on them with careless eye. They might speak to us of the providential care of the almighty Creator and Preserver of the world, and are among those silent utterances of the universe which show forth his praise. Some are to be found on almost all our coasts: some, in small green patches, lie like oases among the barren sands or shingle. They show God's care over minutest things, and so should have their cheering influence over our spirits while the great element itself is, as Keats said, "no mean comforter, while the earth is our throne, and the sea, like a mighty minstrel, playing before it, able, like David's harp, to make such as we forget almost the tempest cares of life."

Most persons who frequent the coast have remarked the sand sedges and sand grasses so often grouped or scattered there. Thus we have our sea-side barley, sea wheat-grass, sea cat's-tail, and other grasses, besides several of the rush and reed tribe, all contributing in a lesser degree, to bind down the driving sands, and some more important ones which will be named. Some of the grasses and sedges of the salt marshes, at a little distance from the sea, afford a saline vegetation very serviceable to cattle. But the sand sedges and

grasses of the shore have, in general, a far more important office than that of even giving sustenance to the beasts of the field. They serve to bind the sands by their long roots, so that our sea sands are not driven inland by the stormy winter winds, which in their strength have been known to carry the salt spray of ocean to a distance of fifty miles from the shore. Some of the grasses destined for this especial purpose, as the upright sea lyme-grass, flower but rarely, and few ripen their seeds by the shore. Indeed, in such unsheltered situations it would be of little use that they should do so, for the high winds which prevail there would either bear their seeds far away to some inland soil, or cast them on the waters of ocean, where they would float and die. But grasses growing on sandy spots are either viviparous, and bear young plants instead of seeds, or, like those of our shores in general, they are propagated by means of subterranean shoots. Wide-spreading shoots, increasing continually by these suckers, give their value to sea-side grasses; and were it not for their aid, inland regions would be desolated by the loose sand of the large sand-banks which, on some shores, the mighty ocean washes up from its bed. The excessively long and creeping roots of the great sea-carex, as well as those of the upright sea lyme-grass, and the sea reed or matweed, are often planted, that they may hold the sand together. In Holland, and in our own county of Norfolk, these grasses have been cultivated in order to restrain the deluges of sand to which these places would be subject. It has been providentially appointed that no animal will touch this grass for pasturage. In Norfolk, where its service is very great, it is called

Marram, a name much resembling *Muran*, which is its name in the Gaelic language. The Dutch owe to these grasses the greater part of their country, which but for the sand-banks, held down by their roots, would have long since been swept into the sea. The fact is, that the sea retires from some shores and encroaches upon others; and such is the situation of the town of Hull, in Yorkshire, that it is generally believed it would long ago have been covered by the waves were it not for the sand-banks at Spurn Point, on which their full force is borne, before they reach the town. These sea-side grasses bind together this useful natural fortification, and thus Hull, like some places on the Welsh coast, and like the shores of France which lie between Boulogne and Dunkirk, especially in the tract near Calais, is saved by its sand-banks, thus preserved from dispersion by the strong matwork of roots running under the surface of their soil. In the sandy soils of Upper and Lower Egypt, the driving sands have buried cities, the ruins of which still appear among the wide-spread heaps. "Nothing can be more melancholy," says M. Denon, "than to walk over villages swallowed up by the sands of the desert; to trample under foot their roofs; to strike against the summits of their minarets: to reflect that yonder were cultivated fields; that there grew trees; that here were even the dwellings of men, and that all have vanished."

But it is not only in countries remarkable for large tracts of sandy soil that whole regions have, by the action of the winds, been converted into deserts. Beautiful and fertile districts in our own country, lands of cornfields and meadows, and trees

and flowers, have been overwhelmed by the sand. In some cases this has been owing to the folly of some persons in the neighbourhood, who have persisted in gathering the grasses for fuel. God has given to the animals the instinct by which they refuse to eat the mat-grass; to man he gives the higher faculty of reason, which should have taught him to leave it untouched; yet let us not blame ignorance, unless our consciences tell us that we are doing all in our power to lessen it. With such perseverance have the peasantry on some shores of our island continued to uproot the grasses, unmindful of all but their own present convenience, that an Act of Parliament was passed, rendering the destruction of these grasses punishable by law.

Burnet mentions several instances of the destruction of property caused by the incursion of sands upon fertile regions. Among others, he informs us that near Downham, in Suffolk, the sand-hills have encroached five miles during the last century; and that in some parts of Scotland, hundreds of acres have been entirely devastated. He also refers to the well-known case of the Coubin estate, near Fores, which was at one time worth three hundred pounds per annum, but which has long been overwhelmed by sand. This terrible calamity befel this estate in 1769; and so rapid were the encroachments of the sand, which came upon it in sweeping heaps, that an apple-tree which grew there, was, in the course of the season, so buried as that nothing but the summit remained visible. This catastrophe was occasioned by the reckless pulling up by the roots, of a quantity of mat-grass, when some trees were cut down.

The difficulty of describing the grasses without

using botanical terms, renders it undesirable in a little volume of this kind, to dwell at length on any but those which seem, in an especial manner, to have been given by the great Creator to our shores for the purpose of holding them down. Of these, the common Sea-reed, or Matweed (*Ammophila arundinacea*), is the most useful, because it is so common a grass. It is entirely a maritime grass, never found but on loose, driving sands, or on such as were formerly so; and as these by degrees become consolidated, so, when the grass has effected the purpose for which it was designed, it gradually pines away, and we find it no more. Very few of its seeds are perfected, but such as ripen fall on the soil where they grow; for, unlike other grasses of this genus, this plant is destitute of the long tufts of wool at the base of each floret, which serve as wings to the seed, and the tiny tufts formed on this are insufficient for the purpose of bearing it away on the winds. Its creeping root is often twenty feet long, and it has a stiff, greenish-yellow stem, about two or three feet high, and long, narrow, glaucous leaves. It flowers in July. It is often manufactured into door-mats and brushes, and in the Hebrides it is used for various purposes. It is twisted into ropes, woven into mats for pack-saddles, and into bags for holding meal and grain; while a common sort of hat is made of its straw, It has also been planted in many places for preventing sand-drift.

Not less serviceable to the shores on which it grows, though far less frequent a plant than the matweed, is the Upright Sea Lyme-grass (*Elymus arenarius*). This is a grass which, if the reader should chance to meet with, he cannot easily over-

look. Few of our native plants are more conspicuous than this, as its tall stem rises four or five feet in height, and its long leaves are so glaucous, that they look remarkable for their blueness of tint, even long before we come near them. This plant may be known from the matweed by its leaves, which are quite flat, and rather broad and slightly notched at the edges; but it chooses for its growth just the same situation as that. Its roots are even tougher and longer, and they form a superior matwork under the soil to those of any other plant. Knapp remarks of it, "This fine grass is not the promiscuous production of all our sea-coasts, but we find it attached to but a few places, and we may seek along hundreds of miles of our coasts, and be disappointed in the end. We have seen it in Norfolk; but at the mouth of the Tees in Durham, called the Snook of Seaton, it abounds, producing in that situation a larger number of spikes than we have seen elsewhere." A coarse sort of fabric was formerly made of its leaves; hence its botanic name of *Elymus* is taken from a Greek word, signifying to cover. The foliage is pungent in flavour, and though, in analyzing the soluble matter of the grass, Sir Humphry Davy found it to contain more than one-third of its weight in sugar, yet none of our domestic animals will eat it. And so the plant grows uninjured, and spreads life around on the else desert sands; for under its shadow rises up many a tuft of grass and tiny flower, which can find a soil firm enough around its roots to spring and blossom.

The Sea-carex, or Sedge (*Carex arenaria*), by its very long and creeping roots, is another of the

grass-like plants which offer some resistance to the sand storm. It is a smaller plant, with triangular rough stems, scarcely more than a foot high, and yellow spikes of flowers; but it is so common, that it is truly a serviceable sedge on our coasts, its wide and numerous suckers creeping among the loose sands. Several sedge plants are equally useful in other places, for in some cases they are the only vegetation on swamps, and, by their growth and decay, ultimately prepare a soil fitted for the growth of pasture.

Our mat-grass or sea-reed seems to be one of the grasses called bents by our older writers, "with which we in London," says Gerarde, "do usually adorn our chimneys in summer-time, and we commonly call the bundle of it, handsomely made up for use, by the name of bents." According to the old poets, there was a regular succession of these simple chimney ornaments, suitable to the season. Thus Herrick, having named some of those of the earlier months, says,—

"When yew is out, then birch comes in,
And many flowers beside,
Both of a fresh and fragrant skin,
To honour Whitsuntide.

"Green rushes then, and sweetest bents,
With cooler oaken boughs,
Come in for comely ornaments
To readorn the house."

And though the various kinds of reeds and rushes, and grassy plants, are not of domestic value, as they were when they were strewed on floors, and when men blamed Cardinal Wolsey for his extravagance, because he had his strewings changed so often, yet in villages, remote from large cities, the sedge has its economical purposes, as the dim

rushlight in the cottage, and the homely chair, and the useful basket might show.

We might look on the reeds and rushes too with the eye of a philosopher, as did Baron Humboldt, when he saw the young Indian drawing a sweet and plaintive accompaniment from an instrument made of a series of reeds. "The Greeks said with truth," observes this writer, "that reeds had contributed to subjugate nations by furnishing arrows; to soften men's manners by the charm of music: and to unfold their understanding by affording the first instruments for tracing letters." And we have seen, too, that to reeds of the shore men are indebted for the very ground they tread on, and for the clearness of the air which they breathe.

Growing sometimes close by the sand-grasses, sometimes on banks and among pastures at a little distance, some of the pretty little flowers called the sandworts are plentiful on our shores; and the name of the genus, *arenaria*, from Arena, sand, is significant of the soils on which they grow. Far away in sandy fields and on heath-lands, in woods, in pastures, and on high mountains, thousands of them are found in our summer months, and one of the species considered as peculiar to the sea shore, is, by many good botanists, thought to be but a variety of the purple sandwort of our gravelly or sandy lands. This is the Sea Spurrey Sandwort (*Arenaria marina*), which is very common near the sea, and, if the same as the inland species, yet it is certainly usually larger and stouter in its appearance when growing on the coast. It has a small purple, star-like flower, with fleshy stem, and leaves of equal succulence, of semi-cylindrical shape, and scarcely

thicker than the stem. The numerous blossoms grow close down between the stem and leaves. This little flower opens at nine in the morning, and closes between two and three o'clock in the afternoon. Charlotte Smith notices its early closing in one of her poems:—

"Among the loose and arid sands
The humble Arenaria creeps;
Slowly the purple star expands,
But soon within its calyx sleeps.

"And those small bells so lightly ray'd
In young Aurora's rosy hue,
Are to the noontide sun display'd,
But shut their plaits against the dew."

A much larger and more conspicuous plant than this is the sea sandwort (*Arenaria peploides*), which is very common. On our sea-side sands, the first-named species would perhaps be scarcely seen, except by botanists, and by children who espy the smallest flowers; but large patches of the sea sandwort, with their smooth shining fleshy leaves, cannot be unnoticed. The flowers are, however, very small; and as they will not open in the shade, and close very early, extensive clumps of the leaves may be found, on which the casual observer would believe no flower ever opened to the sun. The Icelanders, who use several wild flowers as our sweet thyme, and others, to flavour their sour whey, make much use of the sea sandwort for this purpose. They steep this plant in the whey when it ferments; they then strain it off the liquid, and add fresh water to the beverage, which is said, when thus prepared, to taste like olive oil. Some species of Arenaria grow on the very borders of the snow on the Swiss mountains, and several are found on the high mountains of Dauphiné.

A little spreading plant, with linear leaves, called the sea pearl-wort (*Sagina maritima*), is very common on the sea-coasts of England, Ireland, and Scotland. Those who know our other two species of pearl-wort, would at once recognise this, but it has no bright petals to invite attention. Its little green calyx is its only flower. The stems are about two inches high, spreading at the base, and its leaves are slender, smooth, and succulent. The stems and flower-cups are often quite reddish or purplish in tint. It blossoms from May to August.

No pretensions to beauty have the tribe of plants which will next be noticed, but they are a marked feature of sea-side vegetation, on some of our shores where they abound. These are the different species of atriplex, or orache, some of which are to be found on almost all parts of our coast. They have mostly grey, or indeed whitish green leaves, and the flowers usually grow in green, or yellow, or reddish coloured spikes; but excepting when they are red, are not at all showy blossoms. The leaves of the shrubly orache, or sea purslane (*Atriplex portulacoides*), are of a silvery whiteness. This shrub-like plant, however, is not common, though it grows on muddy sea-shores of some parts of England and Ireland. Its stems are one or two feet high, and its flowers, which appear in July and August, are small, and of a yellowish green. It makes a good pickle.

The frosted sea orache (*Atriplex laciniata*) is by no means uncommon on sandy shores, and has much broader leaves than the shrubly kind. The whole plant looks as if covered thickly with hoar frost. In salt marshes, as well as on waste inland grounds,

the spreading halberd-leaved orache (*Atriplex patula*) is also very frequent, growing, indeed, everywhere, but becoming, when near the sea, much more succulent and reddish in tint. Its leaves are, when not thus red, of a dull green and mealy surface, and their triangular forms lobed at the base, are well expressed by the specific name. Then there is the grass-leaved orache (*Atriplex littoralis*), with its grass-like foliage, found chiefly on the East coast in muddy salt marshes; and the stalked sea orache (*Atriplex pedunculata*), with its zigzag stem and spreading branches, which flourishes on the muddy salt marshes of the East and South-eastern coasts of England, and is well known to botanists by the scaly mealiness with which the whole plant is covered. It is sometimes found on the muddy shores of rivers, and Sir J. E. Smith gathered it from the borders of the Ouse, just below Lynn. It is occasionally cooked for food, but unless cut while very young the stalks become tough and unfit for use. The tall shrubby orache, which we often see cultivated in our gardens for its beautiful silver-coloured foliage, is, when wild, a maritime plant, and is brought from the shores of Southern Europe; and one species of this plant, called the garden orache, or mountain spinach, was formerly cultivated as a culinary herb. Several species are valued on the continent as edible vegetables; and in the neighbourhood of Paris the orache is planted to a great extent for the Paris market.

It is difficult, by description, to convey to the unscientific reader any idea of the appearance either of the orache, or its ally the goosefoot. These plants are very similar to each other, not

only in their general aspect, but also in their properties. We have thirteen British species of goosefoot, several of which grow near the sea. There is the shrubby sea-side goosefoot (*Chenopodium fruticosum*), a somewhat rare plant, yet found on the coasts of Devonshire, Cornwall, Suffolk, and Dorsetshire, and also on the Norfolk shore. It was formerly termed the shrubby saltwort, and was first discovered in this country in the time of Ray, by Sir Thomas Browne, the author of the *Religio Medici*. It is an elegant evergreen, and its leaves have a saltish and somewhat acrimonious flavour.

The annual sea-side goosefoot or sea-side blite (*Chenopodium maritimum*), is a very common plant on our sea-shores, and the many-spiked goosefoot (*Chenopodium botryodes*), with its triangular leaves, grows on some cliffs by the sea; but there is one kind, equally frequent with the former, growing especially on the coast, but found also on waste places and on walls, far from the shore, and it certainly deserves its most inelegant name of stinking goosefoot. It may at once be known from all the other kinds by its odour, which is such as would not induce us to gather it. Its small leaves and stems are greasy to the touch, and covered over with a powdery substance, which, when bruised, causes the offensive scent. Professor Hooker well compares this to the smell of putrid fish. Nor can we remember any plant of our lands more disgusting in perfume, except some of the mushroom tribe. Yet this goosefoot is a really valuable anti-spasmodic medicine, and is held in great repute, not only by village doctors, but large quantities were, until recently, sent to

Covent Garden market from some extensive plantation of this vegetable at Mitcham.

Several of the goosefoots are commonly boiled as greens for the table, and several are planted for this purpose. Our own sea-side goosefoot is one of the best of our native species for food. The plant called Good King Henry, or mercury goosefoot (*Chenopodium Bonus Henricus*), a very common kind, growing on waste places and way-sides, with large dark green triangular arrow-shaped leaves, was formerly very generally sown in gardens for spinach, and is still planted in some places, for it is very hardy, requiring little care, and early coming into leaf. The name of good was probably given to it, however, rather because of its supposed virtue in healing wounds, than for its excellency as a table vegetable. Our sea-side species yields soda, and is often gathered for this, with the saltwort and other maritime plants, from shores where it abounds. This substance is largely produced by several of the orache tribe; and, indeed, almost all our sea-side vegetation furnishes it in a greater or less degree. Some of the goosefoots are common articles of food in Peru; and when the mummy cases of the ancient Guanches of Teneriffe have been opened, it has been found, that among the aromatic plants used there in ancient days to make this mortal frame immortal, the Mexican goosefoot (*Chenopodium ambrosioides*) was constantly present.

The plant of our waste places near the sea, called the stinking goosefoot, has been remarked by M. Chevalier, to give out pure ammonia, during its whole existence. Dr. Lindley remarks on this fact: "This is the only observation on record, of

a gaseous exhalation of azote, by vegetables; and the facility with which this principle is abandoned by ammonia, may perhaps explain the presence of azotic products in the vegetable kingdom."

Of all our sea-side plants, boiled for table vegetables, the one which seems to the writer of these pages most to deserve commendation for the purpose, is the sea-beet (*Beta maritima*). Unlike the silvery glaucous foliage of the orache and goosefoot, the leaves of this plant are of a deep rich green colour, very succulent and wavy at the edges. The stems are angular, grow down near the ground, and are one or two feet long, and the flowers are green, and appear in August. When properly boiled, it has the appearance and full flavour of the cultivated spinach; indeed, it is rather superior to that plant, but if not gathered while young, the vegetable becomes too strongly bitter. It is not general around our coasts, but in some places in England it is very abundant, and it grows also on the southern shores of Scotland. At Dovor it is plentiful, not only on the cliffs, but on the upper part of the beach, where a grassy spot may sometimes be seen, on which the bright blue viper's bugloss rises above its prickly stems, and no less prickly leaves; and the lilac mallow, and the yellow dandelion and hawkweed, unite with clumps of orache and sea-beet to make a green and gay patch on the stones. On some parts of the coast it is gathered from the cliff or the muddy shore for food, yet it is often left unnoticed. The English proverb, which our old writer, Fuller, so often quotes, "Fetched far, and cost dear, is fit for ladies," applies, seemingly, as well to the other portion of humanity as to the

fair sex. This sea-side spinach is certainly very wholesome, and if it were not a wild plant would be in much request. The roots of all the beets contain much saccharine matter, and the well-known experiments of the French on another species, the red beet, for the purpose of obtaining sugar, need not be referred to. No such quantity of sugary substance is yielded by other European esculents as by this. This plant is also common as a culinary root, and is also frequently used for salads, and its deep red colour deserves the name given to the whole tribe by our Saxon ancestors; for "beet" appears to be the corruption of their word "bet," which signified "red." The Italians call the plant *Barba Brettola*, and the French term it *Betterave*. The juice of our common beet is said to cure head-ache, and if drawn up the nostrils to occasion sneezing.

We have not more than three or four shrubs which can be called natives of our British shores; the yellow furze bush, however (*Ulex Europæus*), may be very well planted there, for it will bear all the rough winds and the salt spray, and still be rich with golden blossoms almost throughout the year. One of our most beautiful sea-side shrubs is the tree mallow (*Lavatera arborea*), and even this is better known by its place in our shrubberries than by its frequent growth on the cliffs of our island; it, however, adorns some of the rocks on the south and south-west shores of England and the eastern shores of Scotland. The Rev. J. A. Johns, in his interesting work, called "A Week at the Lizard," says of it—"It is a large and picturesque plant, and chooses to perch itself on the insulated rocks all along this coast, in which

situation it sends up its rigid erect stem in defiance of wind and storm. It varies in height from two feet or more." It is very ornamental to spots

TREE MALLOW (*Lavatera arborea*).

where it abounds, for it has large purplish rose-coloured darkly veined flowers, shaped like those of the common mallow of our fields, and darken-

ing in colour at the base of their bell-like vases. It has leaves downy and soft as velvet, plaited and lobed with seven angles; and though of a shrubby nature, yet it is sometimes six feet high, and its round stem branches chiefly at the top, where it forms a leafy canopy. It adorns an islet off the coast of Anglesea, but always grows wild on insulated maritime rocks. On the Bass rock, that lonely island in the midst of the waters, so renowned in Scottish history, it thrives well; and Balfour, who has given us some account of the botany of that island, says that the tree mallow is the most important plant which grows there. This author observes that the Lavatera, according to Sibbald, existed at one time on other islands of the Frith of Forth, as on Inch Garvie and Inch Mykrie; but that it has now disappeared. He adds, that on the rocks, below the fortifications of the Bass rock, it grows in great profusion, and that in the month of July the place is quite gorgeous with its flowers. It also adorns the Ailsa Crag. Like all the mallow tribe, this plant is very mucilaginous in its properties; and its fibres are so tenacious as to fit them for making useful and strong ropes and cordage. Its name of Lavatera was given to it by Tournefort, in honour of two physicians who were friends of that botanist, but who are not known as men of science, and were no way related to the celebrated physiognomist of that name.

The shrub, which, because we see it so much in sea-side gardens, seems more than any other to be characteristic of our shores, and yet which is, by some writers, thought rather to be a naturalized than an indigenous plant, is the French

Tamarisk (*Tamarix gallica*). On many parts of the British coast it is unknown as a wild plant, but it is plentiful on the rocks, cliffs, and sandy shores by the sea, about the Lizard and St. Michael's, Cornwall; and grows near Hurst Castle, Hastings, at Sandgate in Kent, and on several parts of the southern shores of England. Its leaves are of a pale sea-green, and its young twigs are red. The blossoms come upon this shrub in July, and are most elegant feathery spikes of pink flowers. Fuller says that the Tamarisk was first brought from Switzerland into England by Bishop Grindal, when he returned from the exile into which he had been sent in the reign of Queen Mary, and planted it in his garden in his native land. It grows abundantly on the Tanaris, now called the Tambra, on the Spanish side of the Pyrenees, and hence the plant was named from the Tamarisci, the people who inhabit these countries. Very pretty hedges of it grow luxuriantly around Boulogne, on the French coast, and Sir J. E. Smith observed there that the sheep so preferred its branches to any other herbage, that they never touched another plant so long as its boughs grew within their reach. It is one of the most common productions of the Arabian desert, where its green leaves afford a welcome, though slight shadow, and the camels crop its graceful branches. The Oriental Tamarisk is by pre-eminence the tree of Egypt, for on its saline and sandy soils no other tree rises which can give wood enough for fuel or for furniture but this. They call it the Atlé, and the Egyptians have a proverb, that the world would go ill with them if Atlés were to fail.

Our French Tamarisk, when it attains any size,

has a very hard wood. Fuller refers to the practice of making cups of this wood in his time; and Gerarde records, as a fact, the fiction that ale or beer is the more wholesome when drunk from a cup of Tamarisk wood. Our forefathers thought, too, that their meat was the sweeter if roasted on a spit made of the wood of this shrub. It has one sad historic association, however, for the Romans were accustomed to bind a garland of its cypress-like boughs around the brow of the criminal condemned to execution, and from its frequent use in these mournful wreaths, it was called the unhappy Tamarisk.

More frequent than any other wild shrub on our shores is the common sallow-thorn, or sea Buckthorn (*Hippophæ rhamnoides*), which, because of its pretty silvery foliage, is often honoured with a place in our garden or shrubbery. It is common on the sand-hills and cliffs of the east and south-eastern coasts of England: and the small green flowers come out at the same season as the young slender leaves, in the month of May. It is a thorny shrub, and smaller when wild than when planted in gardens, seldom reaching, on the cliff, the height of five feet. In autumn the shrub is bright with the deep orange-coloured berries, which it bears in great profusion, and which are really very pleasant fruits, of an acid flavour, and very juicy. These berries are much eaten by the Tartars, and the fishermen of the Gulf of Bothnia gather baskets full of them in autumn for the use of their families; and a preserve is made of them which imparts a delicious flavour to fresh fish. The leaves are of a very dark green above, but beneath are very silvery. Stems, roots, and foliage, are all

full of a yellow dye, which they impart readily. This plant never grows wild inland, though it does not require a saline air or soil.

A flower called the sea campion, or catchfly (*Silene maritima*), is very frequent on the sea-shore above the water-mark, and it grows too beside some of those clear rivulets which run along the Alpine hills of Wales, and other mountainous parts of our island. It very much resembles that common flower of our hedges and pastures, the bladder campion, and has the same glaucous green leaves, and bladder-like flower-cup, beautifully marked with a net-work of purple veins. Like that, too, it has the white starry flower, but its blossoms are generally larger. Some writers consider it only a variety of this bladder campion, altered, in some of its features, by its place of growth. This genus was named catchfly, from the viscous substance which is found on the stems and leaves of some of the species, but it is not on this. It has a creeping root, and the stems are often quite prostrate near their sandy bed. It has generally but one flower, though sometimes a little cluster of two or three may be found on the summit of its stem.

One of the most common of the little flowers which grow on our muddy shores and salt marshes is the sea milkwort, sometimes called the black saltwort (*Glaux maritima*). It may be easily described so as to be known when seen even by a reader unacquainted with botany. It has stout branched stems, often lying on the ground, and about three or four, or sometimes even five inches long. The leaves are of a glaucous green tint, opposite to each other on the stalk, and are small

and succulent, and without leaf-stalks. Pretty little pink flowers, freckled with red spots, may be seen on it in June and July, growing singly between the leaves and stem. Loudon observes of this little plant, that it is well adapted for pots and rock-work, and that it will grow at a distance from the sea, if the sand on which it must be planted is kept well moistened. It rarely grows wild inland, except on the shores of salt rivers.

Far less frequent, but an equally pretty little blossom, is the creeping pale-blue toad-flax (*Linaria repens*), which grows on chalky banks and rocks on some parts of the sea-side. The flowers are shaped like those of the common yellow toad-flax, but are blue and yellow. It blooms in July and the two following months.

Not unfrequently we may find, on rocky or sandy places about our coast, some handsome tufts of the white English stonecrop (*Sedum Anglicum*). Both in Scotland and Ireland this plant is abundant, not only on cliffs near the sea, but upon inland rocks; and there are some shores of England on which it is one of the prettiest plants. Its leaves are very succulent, and have somewhat of the sea-green tint, and its flowers, which are at first thickly clustered, but afterwards open into a larger and more scattered bunch, are beautiful white star-like blossoms, with purple anthers, and a reddish mark on each petal besides being generally covered at the tips with rosy spots. Few would pass it by without notice when, in July, it opens its flowers to the sunshine. It is one of a large class of plants, all natives of sandy or stony soils, and all having the succulent foliage, and the small roots of plants destined rather to thrive on

rains and dews than on the substances sucked up by roots from soils. Several of the Sedums, among them the common yellow stonecrop of our walls, were formerly used as a medicine, and another was one of the plants much used in London for the burning of bonfires on St. John's Eve. This was the Orpine, or Live-long (*Sedum Telephium*). These plants were, some centuries since, commonly called Midsummer men; and an old herbal records of the Orpine, "The people of the country delight much to set it in pots and shelles on Midsummer Even, or upon timber, slates, or trenchers daubed with clay, and so to set or hang it up in their houses, where it remaineth greene a long season, and groweth, if it be sometimes over sprinkled with water."

There is a plant found on our sea-side cliffs, but which is more abundant on the high mountains at the north of England and Ireland, as well as the north-west of Scotland, where it is very common. This is the rose root (*Rhodiola rosea*). To such of our readers as know the Orpine, we may say that this plant very much resembles it in its appearance. The blossoms are yellow, and grow in small compact clusters. The leaves are crowded about the stem, and are of a broad oblong shape, and notched at the edges; in some specimens they are much tinged with red, and they are very juicy. The root is large and woody, and when dried in the sun, it yields an odour which is scarcely inferior to that of the blossom of the rose. It is a small plant, seldom exceeding ten inches in height, and without branches.

One species of our wild docks grows especially on salt marshes, near the sea. The Golden Dock

(*Rumex maritimus*) has flowers of a bright orange colour, in crowded whorls, on an angular furrowed stem, about one or two feet in height, and long narrow leaves. It is well named, for the whole plant, in process of time, becomes of a golden hue. The docks generally are well known to those at all familiar with flowers, and this has much similarity to the other species. They have little beauty to recommend them to notice, and cultivators of land well know the trouble given by the dock plants. Some of them, however, have very large and handsome leaves, which the artist welcomes as a suitable ornament to the foregrounds of his picture. This family of plants produces an immense number of seeds, and ripens them so rapidly, that were it not, that being heavy, they are less easily dispersed than others, and will not, like the thistle-down, float far away on the summer air, the land would be overrun with docks. Another circumstance which renders them difficult of extirpation from the soil is, that unless the root is completely extracted, little has been done; for a very small remaining portion will generate buds, and send shoots to the surface. In olden times, however, docks had their repute as medicine; and the Alpine dock, a rare British species, though common in France, was called monk's rhubarb, from its frequent use in the monasteries instead of the oriental plant. Other species have been used as external remedies, and some cultivated as spinach. Our common Red-veined dock (*Rumex Sanguineus*), with its curled leaves and red veins, is said to be a good vegetable when boiled. Children know it well; for the leaves of this, and other species common by the road side, are often placed on the hand smarting from the

sting of the nettle, when, heedless of its presence, they have grasped the blackberry or wild rose. Most of us have fancied that it allayed the pain; and it may at least have the praise so often bestowed by rural simplers, on their approved remedies, that if it does no good, it will do no harm. The golden dock of our salt marshes blooms in July and August.

An old writer on the art of Simpling, says of all the plants of this genus, "Alle kinds of dock have this property, that what flesh or meat is sod therewith, though it be never so old, hard, or tough, it will become tender and meet to be eaten;" but it would seem this, as well as some other herbs named by old writers, had strangely lost their ancient virtues.

At about the same season of the year the rambler of the sea-side may find two very pretty flowers blooming on our sandy shores, and when they grow in any quantity, giving a gay appearance to the spot. One of them, however, is not a very common flower, though there are some places in which the Sea Bindweed, or Convolvulus, is plentiful. This pretty plant (*Convolvolus Soldanella*) has large purplish-pink blossoms, with pale-yellow plaits, and succulent sea-green leaves. It is so frail a flower that we can scarcely gather it, and is a native of the sea-coast of many parts of Europe and Asia. Its young stalks are sometimes pickled. The other flower, or rather flowers (for three species grow near the sea more than elsewhere), are the red Centauries. The dwarf-branched Centaury (*Erythræa pulchella*) is common on the sandy sea-shores of England and Scotland, and is generally about five or six inches high, with a slender leafy stem.

At the top of this is a cluster of rose-coloured, star-like flowers, which, like those of all the species, only open in sunshiny days, and close early in the

SEA BINDWEED, OR CONVOLVULUS *(Convolvolus Soldanella).*

afternoon. On similar places grows also the dwarf-tufted Centaury (*Erythræa littoralis*), which is generally a lower growing plant, with a more dense cluster of blossoms, which appear a month earlier in the year; while the broad-leaved Centaury (*Erythræa latifolia*) grows on the sea-shore with a

strong, stiff stem, and broader leaves. This species is very frequent in the Outer Hebrides, where it is gathered for the purpose of being infused in spirits as a bitter. These three plants, as well as the common Centaury of our inland pastures, are thought by some writers to be all of one species, varied only, in some slight particulars, by the circumstances of soil and situation, which reminds us of a celebrated botanist, who had written some valuable papers on the rose, and who, on being asked how many species there were, is said to have replied, somewhat drily, "I really cannot say, but I am sure there is *one*."

The Gentian is nearly allied to the Centaury, by its intensely bitter principle, and until later years the centauries were called gentians. Our true British gentians have all, however, deep blue or purple flowers. The field Gentian (*Gentiana campestris*) is a beautiful purplish-blue flower, with many blossoms, common in chalk or limestone soils, and frequent in Scotland near the sea. This is one of the plants used in Sweden instead of hops.

A little flower called the Sea Heath (*Frankenia lævis*), with slender, crowded leaves, wiry stems, and pale rose-coloured blossoms, is sometimes found on the salt marshes on the eastern coast, chiefly, of England. It is not a common plant of our shores, though it is so on many maritime places of Europe, and on the Canary Isles it is very plentiful. It is sometimes white. It is but an humble plant, and so too is the powdery Sea Heath (*Frankenia pulverulenta*), which is very seldom seen here, though it has been found by botanists on the coast of England. This little flower grows plentifully by the sea, in many parts of Europe and Asia. This genus

was named in honour of John Frankenius, Professor of Botany at Upsal.

An equally rare and lowly plant is the Sand Strapwort (*Corrigiola littoralis*), found sometimes on the

SAND STRAPWORT (*Corrigiola littoralis*).

south-western coast of England, though but three spots are named as its place of growth;—the Star Point, and the Slapham Sands of Devonshire, and the shores of the Loe Pool in Cornwall. In the latter place it thrives among the shingle, on several parts of the shore. It always grows in places which in winter are covered by water. It has numerous slender leaves, somewhat fleshy, and very glaucous, and stems spreading over the ground, and numerous small white blossoms.

In the South of England, too, as on the Babbicombe rocks, by the sea, and on the rocks near Torquay, may be found the beautiful crumpled flowers of the white Mountain Rock-rose (*Helian-*

themum polifolium), which is a shrubby plant, and so lovely a one that the botanist regrets that it is not more general around our island shores.

A genus of plants which were highly valued some centuries since, for their antiscorbutic properties, and to which has therefore been given the name of Scurvy-grass, has several species, which grow commonly near the ocean, or on rocks which overhang its shores, or on the marshes which share their saline airs and soil. The common Scurvy-grass (*Cochlearia officinalis*) grows alike on rocks or muddy sea-sides, on the margins of salt rivers, and on the tops of elevated mountains; and there is no doubt that it has powerful and valuable medicinal properties. Invalids often take its expressed juices; and in days when salad herbs were rarer in this country, this was cultivated for the purpose. It has thick succulent leaves, and white flowers, of the cruciferous form, and blossoms in May or June. It may be found on almost all parts of the coast in abundance. The French term this plant *Cranson officinale*, and the Germans *Löffelkraut*. When fresh it has a bitter and acrid flavour, which is lost in process of drying.

The Greenland Scurvy-grass (*Cochlearia grœnlandica*) is much like the last-named plant, but not so frequent, though it blossoms in June and July on some parts of our shores, and on the Highland mountains. More general than this is the kind called English Scurvy-grass, which, with the Danish Scurvy-grass, grows plentifully on muddy and rocky sea-shores. The Danish species is also a native of Kamtschatka, and even more abundant in the north of Europe than with us. Thick tufts of the juicy leaves of these scurvy-grasses are found

within the arctic circle, where scarcely any other plants than lichens and mosses exist, and where even the hardy race of pines, generally so fitted to bear the blasts of northern tempests, yet dwindle into stunted shrubs. The Scurvy-grass and the different species of sorrel, both of which are welcomed by the mariner as an antidote to the disease generated by the salt provisions of a long voyage, were found by Captain Parry, flourishing under the snow, at the very farthest limits of vegetation.

One of the handsomest of our sea-side flowers is the Vernal Squill (*Scilla verna*), which cannot be termed a common flower, as it is rarely seen on the southern shores of this island. On the coasts of the west and northern parts of Great Britain, its beautiful deep-blue bell-flowers scent the air, usually bearing in it so little of the odour of wild flowers. It is about three or four inches high, with numerous deep-green slender leaves; but its size varies much, according to differences of soil and situation. In August and September the Autumnal Squill (*Scilla autumnalis*) makes its appearance on some parts of our shores, especially at the south of England. The flowers are not so pretty nor so brightly blue as the spring species; and it is not until they have withered that the leaves come up from the root. They have a pinkish or lilac tinge.

But rarely on the English coast do we find that very elegant flower, called by some botanists the Sea Gromwell, by others the Sea Lungwort or Sea Bugloss (*Lithospermum maritimum*), though on the sea-coast of the north of England it sometimes blooms among the sand or loose stones of the beach;

but it is very plentiful on the north and west of Scotland. "This fine plant," says Dr. Walker, "was described in Scotland above a hundred years ago, by

VERNAL SQUILL *(Scilla verna).*

the learned Sir Andrew Balfour, and afterwards by Ray, as growing on the sea-shore near Berwick. It was found in flower at Icolmkill, on the 2nd of July,

and is frequent upon the stony beach of most of the Western Islands, where it highly ornaments the shores with its beautiful flowers, and the elegant glaucous colour of its foliage. It is reckoned by Dillenius the most beautiful plant that is native to England. It is remarked by Linnæus as being sometimes annual and sometimes perennial, but upon the shores of the Hebrides it appears to be constantly biennial. Upon the coast of Ireland, however, where it likewise grows, it will probably be an annual plant, and perennial in a warmer climate than that of Britain." The sea-side Gromwell has been again seen on the shores of Berwick within the last few years. It is quite a plant of the north, extending even to the dreary arctic regions. Its blossoms are of the most brilliant purplish-blue tint. Sir William Hooker remarks of it, that when the bloom is rubbed off, rough callous points are seen upon the surface, which become white, and almost stony in drying, when the rest of the plant is nearly black. This genus of plants contains a good deal of flint in their composition, and it was from their shining, hard nuts, that their botanic name was formed, of two words, signifying a stone and seed. This hardness was noticed of old in our own land; for the English name, Gromwell, has the same origin in Celtic—*graun*, a seed, and *mil*, a stone. It has been observed that the flavour of this maritime species resembles that of oysters.

Very frequent on sandy sea-shores is the showy flower called the Purple Sea-rocket (*Cakile maritima*), with large, cross-shaped blossoms, of a purplish-lilac colour, growing in thick clusters. The whole of the plant is smooth and glaucous, and

very succulent. It has been found on the coast of Ayr, with white flowers, and blossoms in June and July. It grows along the shores of different countries, from Sweden and Lapland to Gibraltar, and is also found on both sides of the Mediterranean Sea.

We have already noticed some of the culinary vegetables which originated in the wild plants of our shores. Indeed, some of our best esculents have been derived from the sea-side; and the wild cabbage, and the wild kale, and the asparagus, all have their native homes where ocean's roar is heard, and where sea spray and salt soil water and nourish them. The French writers term our Kale (*Crambe maritima*) the *chou marin d'Angleterre;* and it appears to have been sent from England into France before the middle of the sixteenth century. It is a hardy perennial, and when fully grown, a very beautiful plant, with its delicate sea-green surface, powdered over with its whitish bloom, and a tinge of purple here and there on its foliage, and its white, honey-scented flowers. It is very common on some sandy and stony lands near the sea; and where it is abundant, it has been customary, from time immemorial, for the people of the neighbourhood to watch for the time when its young leaf-stalks and shoots emerge from their sandy beds, which is in the month of March or April. They cut these off as they might do the asparagus, and boil them for table; and the blanched shoots of the cultivated plant are too well known to require comment. In some countries on the Continent, the large, purplish-green leaves have been boiled as greens, yet they are not of a very palatable description, unless eaten when very

young. There is, however, a difference of taste in these matters; for Dr. Walker, who gathered this plant from the Bass Rock, remarks that the leaves were large, tender, and succulent; and says that he and his friends had a dish dressed of them, and agreed in thinking them preferable to any other greens they had lately tasted.

It is now nearly a century since the Sea-kale was brought into repute in our country, by Dr. Lettsom, who highly praised it. In English gardens it is cultivated and blanched, by excluding the light with sands, ashes, or some other opaque substance. The root of a species called the Tartarian Sea-kale is very sweet, and is eaten uncooked, with vinegar, oil, and salt, or it is boiled. It is so well liked by the Hungarians, that they call it Tartarian bread.

The Asparagus (*Asparagus officinalis*) was by our forefathers termed Sperage or Coralwort, while some good old English writers called it by a name still in common use among uneducated persons, Sparrow-grass. It is a native of several parts of the south and south-west coasts of England. The little island called Asparagus Isle, at Kynance Cove, Cornwall, received its name from the abundance of this plant growing on that spot, to which in autumn its bright yellow feathery foliage and scarlet berries are a very picturesque addition. It is also described as growing in great plenty on the pebbly beach near Weymouth, and on the Links near Gosford, in Scotland. On several maritime places of Europe it is an abundant production of the sands; and on the sandy steppes of Russia and Turkey, as well as on similar spots of the Greek islands, it is found far away from the

sea. In North America, too, the Asparagus grows among the maize in fields, but in no wild state is it equal in size to the cultivated plant. The Asparagus of our own shores is seldom larger than a goose quill, and not worth cooking. This plant is one of the few on which the praise of ancient and modern writers have been alike bestowed, for Pliny and Cato told of its virtues, and the Greeks have transmitted it to posterity under the name which it has now. It must be observed, however, that the Greeks, like us, had several plants whose young shoots were used as food; thus their term Asparagus seems to have included not this alone, but a variety of other pulpy stems. Long before the culture of vegetables for the table had become general in this country, this had received attention; but nowhere do we read of finer plants than were said by Pliny to be reared by the Romans, as three shoots of the vegetable grown at Ravenna are stated by that naturalist to have weighed a pound.

A large quantity of Asparagus is raised around London, and it is thought by some horticulturists that the plant might be cultivated to advantage on many parts of our coast on soils consisting of little else than sea-sand, and which afford too little nutriment for the growth of other than naturally maritime vegetables. The French call the plant Asperge, and it is much planted around Paris.

In reading the travels of those who have gone over the sandy deserts of other countries, we find frequent mention of different species of the Asparagus genus, very unlike our own plant, and presenting a formidable barrier to the approach of the passenger. The Cape Asparagus has crooked thorns, which if they hold the traveller by his

clothes, will not let him escape without many a rent, and the inhabitants of the country call the plant Waht en beetje—"Wait a bit." Then there is the linear-leaved asparagus of Ceylon, with shoots five or six feet in height, thickly beset with spines, and the roots of which afford food to the Cingalese; and another species, a native of Spain, with thorns as large as a finger, which will not let you touch it without tearing you. Well might the genus receive the name of Asparagus, from a Greek word to lacerate, for few except our native species are unarmed.

On our salt marshes we may gather from May till the end of summer, the sea-side Arrow-grass *(Triglochin maritimum)*, which is a common but not a conspicuous plant, and not much unlike, at first appearance, one of the plantains. It has a stout stem, long narrow leaves, and small greenish flowers; it has a salt flavour, and cattle, especially cows, are very fond of it.

On the rocky coasts of the North of England, and very abundantly on the shores of Scotland, the Scottish Lovage *(Ligusticum Scoticum)* rears its head and grows to a large plant, fearless of winds and tide. It has broad, smooth, dark green leaves, and a cluster of small white flowers with a reddish tinge, which appear in July. When bruised, the foliage of this plant emits a powerful odour resembling that of parsley. In the Isle of Skye the Lovage is eaten in its natural state, and called Shunis, and it is also thus eaten in several of the northern isles of Scotland as well as boiled for greens. Ray mentions of it, that in his time the Highlanders gathered and ate it early in the morning before they touched any other food, to preserve them through the day from infection;

and probably its strong aromatic flavour would really render it a suitable plant for such a purpose. They call the Lovage the Sea Parsley. Its acrid root is occasionally chewed by the Hebridians as a substitute for tobacco. The boiled or raw plant seems wholesome, and some writers describe its flavour as agreeable, but persons unaccustomed to it would wonder how so nauseous and acrid a vegetable could ever be valued or indeed used as food.

The Lovage is an umbelliferous plant, as are the samphire and some others yet to be named, and it seems desirable to explain this term, as the whole tribe are sufficiently alike to enable a reader unacquainted with botany to recognise any individual as belonging to it.

The Carrot and the Parsley are very familiar instances of umbelliferous plants. Every one knows their blossoms, and will remember that the little flowers grow in a cluster on stalks, all proceeding from one central point, and diverging like the rays of an umbrella. Plants of this form abound by our waysides, in hedges and in ditches, and several on the rocks or salt marshes of our shores. Their blossoms are among the least attractive of our wild flowers, but they are a tribe most important to man; they are, when cultivated, extensively used as food, and though the most dangerous poisons lurk among their juices, yet skill and science have made these very poisons contribute to the recovery of lost health. The Parsley, Celery, and Carrot of our tables need no praise; and even some, which, when wild, are of most dangerous quality, may be safely eaten when cultivated. They have mostly hollow stems, and cut leaves, clusters of tiny flowers, either white or

greenish, or yellow; now and then tinged with pink. It is generally considered that plants of this tribe which grow in ditches and damp places are poisonous, and indeed in some of the sorts usually deemed wholesome, the damp soil seems to have a pernicious effect and to render them dangerous. Dr. Walker remarks of our maritime kinds—"Though I would not propose it as a rule to be depended on in so dangerous a case as poisons, yet I think it highly probable that all the maritime plants of this class are salutary and excellent. This I am certain of, that none of the umbelliferous plants known to be poisonous are stationed near the sea-shore; all the maritime plants whose qualities are known are innocent; and it is further remarkable that this is not to be ascribed to their dry situation among the maritime rocks, or upon the sandy beach; for the Celery and Sulphur-wort grow in the salt marshes in as watery a soil as any of the umbelliferous aquatics that are poisonous; but here I imagine lies an essential difference between plants that inhabit salt water and fresh." Although this remark may, as Balfour observes, be a little too general, there is doubtless much of truth in Dr. Walker's statements on this point; and most important investigations are now making on vegetable poisons, by means of which they will probably be in a few years better understood.

Any one who has ever visited Dovor in the month of May may have noticed how completely some of the white cliffs at the eastern end of the town seem covered with the yellowish green clusters of a large and conspicuous umbelliferous plant. This plant is not peculiar to the sea-side, for it grows sometimes on inland spots, but it is

one of those which seem especially to luxuriate on the rocks around our coasts. It is the common Alexanders (*Smyrnium olusatrum*), or, as the people in some places term it, the Salamanders. The stem is about three or four feet high and very thick and furrowed, and the leaves are of a bright yellow green. It was formerly much used as a pot-herb, and it appears to be perfectly wholesome, though by what means those who ate it were brought to think its flavour agreeable one would wonder much, for its very odour is most offensive, and it is very pungent. Yet that it was really much used and valued in bygone times appears from the fact that its botanic name was formed from *olus*, a pot-herb, and *ater*, black, the latter word probably alluding to its black fruits. Pliny says of it, that the juice smelt like myrrh, and its generic name Smyrnium is a synonyme of the name of that valued resin. It would probably be improved by culture. The French call it Maceron.

The common Fennel (*Fœniculum vulgare*) is another plant of the umbelliferous tribe, which is very plentiful on the chalky cliffs of England by the sea, and also on chalky soils near salt marshes. It is rarely found inland, except in the neighbourhoods of some towns but little removed from the coast. It is well known in the eastern parts of England, by its frequent culture in the kitchen-garden, where it is planted, that its boiled leaves may be served up with mackerel, though our modern gardeners—happily for morality—have forgotten the old notion, that the Fennel would not thrive unless the plants were stolen. It has a hollow stem, three or four feet high, and slender dark green leaves, and may at once be known

—if seen in July or August—by the deep golden hue of its flowers, which colour is a rare ornament in this tribe. It is of old repute as a seasoning herb, and its almost sickly odour seems to have been much esteemed in former days, as it is one among the sweet flowers named by Shakspeare; and Milton alludes to it:—

> "When from the boughs a savoury odour blown,
> Grateful to appetite, more pleased my sense
> Than smell of sweetest Fennel."

The roots are roasted and eaten by the Hottentots in the same way as anise; and the seeds, which are considered carminative, are often used as medicine for infants.

The wild Carrot is well known to all lovers of wild flowers, with its cluster of white blossoms, with a dark purplish red flower in the centre, and its graceful leaves, once deemed a worthy ornament for the head-dress of court ladies. There is a wild species called the Sea-side Carrot (*Daucus Maritimus*) found on the coasts of Kent and Cornwall, as well as some Scottish and Irish shores, very much like our common carrot or bee's nest, but smaller, having broader and more succulent leaves, and wanting the little purple blossom in the centre, which so often helps those but little familiar with our wild flowers to identify the Carrot among the many white blossomed umbelliferous plants which resemble it. The roots of both species are similar, and there are writers who think that they constitute but one kind. These roots have the colour and something of the strong odour of the garden carrot, but are too stringy and small to be to any extent serviceable as food, though the people of the Hebrides, who well know how to turn to good

account the wild plants, cook and eat them. Botanists very generally believe the little wild Carrot to be the origin of the valuable cultivated vegetable; but Miller and other horticulturists have taken great pains, by culture, to change the carrot of our waysides into the edible one, and have failed. If, therefore, our native species was that from which this valuable root sprung originally, it is probable that the plant was first cultivated under a warmer temperature than that of our island. The Carrot was first sown in England in the reign of Queen Elizabeth, by the Flemings, who were compelled by the tyranny of Philip the Second, to take refuge on our shores. Our countrymen, at that period, knew little of vegetable gardening, and the refugees finding that the soil about Sandwich in Kent was favourable for the growth of one of their favourite articles of diet, they soon sowed their seeds in the soil. It shortly became a plant of general culture here, and it is not improbable that its seeds dispersed themselves, and so naturalized the plant in this island. It is cultivated most successfully in a soil mixed with sand, and we generally find a good deal of the wild plant on sandy coasts. Our word carrot is from the Celtic, *car*, red.

The Wild Celery or Smallage (*Apium graveolens*) is another umbelliferous plant common on our coasts, though not peculiar to the sea-side, and a frequent plant of the salt marshes is the Parsley-water Dropwort (*Œnanthe pimpinelloides*), with its flesh-coloured flowers growing on a stem about two feet high. This dropwort is certainly a most dangerous poison when growing in some of its native spots, yet soil and culture have a peculiar effect on it, and it is cultivated about Angers for

the sake of its roots, which are there called Jouannettes. At Saumur, too, these roots are cultivated, and there called Méchons. This plant is remarkable among its tribe for having undivided leaves.

An umbelliferous plant, called the Slender Hare's-ear (*Bupleurum tenuissimum*), is a native of our salt marshes on the south and south-east coasts of England. It has very slender wiry stems, and small green clusters of flowers, and is not a conspicuous plant.

The Sea Sulphur-weed (*Peucedanum officinale*) is a much more rare plant of the salt marsh. It has been found on the shores of Kent and Sussex; it has bright yellow flowers, growing in large clusters. A resinous substance is found in the roots of some of the species, and the whole of this plant has a strong odour of sulphur. The root is highly stimulating, and very fetid and acrid. It has been used as medicine, but is apparently dangerous for internal use.

But leaving a tribe of plants which are rather useful than beautiful, we must notice that very handsome and not unfrequent flower of our salt marshes, the Star-wort, or Michaelmas Daisy (*Aster tripolium*). Every one knows our common autumnal garden flowers of this name, some of them very handsome blossoms, but all sufficiently like this to enable the reader at once to detect it. Its starry lilac rays are arranged round the yellow disk, and it grows in clusters at the top of a succulent stem, which, as well as its no less juicy leaves, are of saltish flavour. There is little on the salt marshes during the months of August and September which is very attractive, and these flowers are often at

that season almost the only bright things which invite the passing bee to taste their sweets. This flower is found not only near the sea, but on the shores of some salt rivers, as the Medway in Kent, and is so far from being a rare plant, that one would think most British botanists might, at some time or other, examine it for themselves. Yet the old writers told strange things of it, and one excellent old herbalist, Gerarde, says—"It is reported by men of great fame and learning, that this plant was termed tripolium because it doth change the colour of his floures thrice a day. This herbe I planted in my garden, whither, in his season, I did repair to find out the truth hereof, but I could not espie any such variableness herein; yet, this much I must say, that as the heat of the sunne does change the colour of divers floures, so it fell out with this, which in the morning was very fair, but afterwards of a pale and wan colour, which proved that to be a fable which Dioscorides says is reported by some, that in one day it changeth the colour of his floures thrice; that is to say, in the morning it is white, at noon purple, and in the evening crimson." Even the admission of Gerarde, however, as to its changes by the heat of the sun, had more in it of fancy than of fact; and for aught that the writer of these pages could ever see in the flower, it has the same pale lilac tint from "opening morn till dewy eve." Our herbalist says that women by the sea-side call it blue daisies and blue camomiles.

Another pretty flower of the sea-shore is the Great Sea-stock (*Mathiola sinuata*), which flowers from May to September upon some sandy shores of Cornwall, and also on the Welsh coast, but

cannot often be gathered wild. Its stem has spreading branches, and is about two feet high, with downy leaves. The whole of the plant is covered with dense starry hairs, and short prickles, each rising from a little glandular base. The large handsome flowers have little odour during day, but when evening comes diffuse great sweetness on the air, and the wanderer by moonlight, or even beneath the dark and cloudy sky of night, might pause to wonder that so sweet a scent should be wafted to him by winds, which at that season he would not expect to bear upon them the odour of the flower. The hoary shrubby stock (*Mathiola incana*), which grows often plentifully on the rocks near Hastings, is not truly wild there, though generally enumerated in the list of flowers which form our British flora. It is the origin of our garden stock gilliflower, and is, as Dr. Hooker observes, generally treated by our gardeners as an annual or biennial. The pale lilac Virginian, or more properly Mediterranean stock, is sometimes enumerated among our native flowers of the sea-shore. It is very plentiful on the coasts of the Mediterranean, and may, like others, have been naturalized on our isle. But, as has been observed, it grows wild under the cliffs between St. Margaret's and Dovor, where there are no houses near, and therefore it is not likely that it is there the outcast of a garden.

Who that wanders by glen or over hills when wild flowers cluster, is not glad to be greeted by the scent of the wild Rose? Who is not ready to admit, with Pliny, that the rose is the first of flowers, and the lily the second? We no longer think the fennel has the sweetest of scents, nor

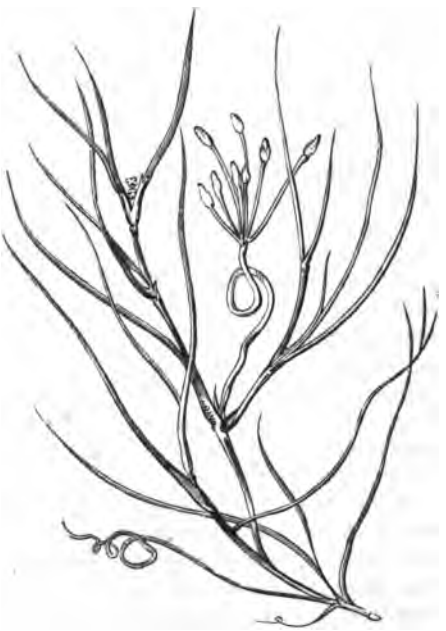
consider the flower which we now call the Prince's Feather so beautiful as that the "pencil of the most curious painter is at a stay when he comes to set him downe in his lively colours." But we can rejoice still with Hafiz, when he sang, "O cup-bearer, the season of the rose is come," and could respond to the feelings of the writer of the "Wisdom of Solomon," when, rejoicing in the glad season of the early year, he sang, "Let no flower of the Spring pass by us. Let us crown ourselves with rosebuds before they be gathered." The rose is as much loved as ever, and gathered with delight, whether it hang out from the pleasant hedge of some green lane, or we meet with it unexpectedly growing on the sands among the sea-weeds and other objects which the wind has carried up from the waters, to strew the shore. Few, indeed, are the roses to be found here, yet one is by no means uncommon, even close down, and unsheltered from the sea-breeze; while on sandy fields, at a little distance from the sea, it is very abundant. On many inland chalky and sandy places it is a well known blossom, and generally a favourite with those who are fond of wild flowers. The Burnet Rose (*Rosa spinosissima*) is the earliest flowering kind of all our wild roses, and though it has not the delicate blush of the wild brier, it is extremely pretty, with its small flowers, sometimes tinged with cream colour, sometimes lightly tinged with a dash or two of pink hue, but more often of pure white. It generally, when growing near the sea, lies very flat on the shore, but its branches are covered with its sweet-scented flowers, the odour of which is said by Sir William Hooker to be in some varieties disagreeable. It spreads widely,

but never grows on the shore to any height, and its leaves are very neat and pretty, being formed of very small leaflets, generally about seven in number, very finely notched at the edges, and of a full green, with somewhat of a glaucous tint. One might as well attempt to gather a handful of thistles, as to make a nosegay of these roses, for its stems are crowded with prickles, some of them very long, and interspersed with multitudes of smaller ones, all of a dark brown colour. The flower is not succeeded by the scarlet hip of the dog-rose, but it has a dark purplish black berry, which schoolboys call the Cat-hip. Dr. Johnston says, this is the only wild rose found in Holy Island, where it grows on the sandy sea-banks; and Dr. Walker observes, that several parts of the shores of Jura and Isla are highly ornamented with this beautiful little flower, which is in full blossom about the end of June, on the stony beaches of those islands.

Another of our roses, called the Red-fruited Dwarf-rose (*Rosa rubella*), has been found on the sandy sea-coast of Northumberland, but it grows there very sparingly. The Burnet-rose is the origin of our Scotch garden roses, and they are not greatly changed by culture.

It is pleasant, when roaming along the sea-shore, to linger near some of the salt-water pools, watching the lighter sea-weeds, as they float up and down, and seem to be brightened by all the tints of the rainbow. The naturalist loves these spots, for there he sees living creatures of minute beauty, finding their home and enjoyment. And the botanist loves them too, for here he may find some of the most delicate marine weeds, and here,

too, he may chance to meet with that interesting plant, the Sea Ruppia, or Tassel-grass (*Ruppia maritima*); flower it can hardly be called, since it has no gay coloured petals to distinguish it. It is not uncommon in salt-water ditches and pools, growing wholly submersed. Its stems are like



TASSEL GRASS (*Ruppia maritima*).

slender threads, bending about and sending off many branches, on which grow long pointed leaves like bristles. The whole plant might be at first taken for a sea-weed, but its structure is in reality very different from that of any marine vegetable.

In their early stage the flowers grow quite under water; but as there comes a time when they need air and sunshine, the stalk which supports them becomes spirally lengthened, until the blossoms all rise up above the surface of the pool. But the seeds will not ripen there, and after the blossom has for awhile remained in the air, again the spiral stalk curls up in close coils, and goes down to the base of the waters.

In wet shady places near the sea, and on salt marshes and maritime cliffs, grows a plant with bunches of numerous small, cross-shaped flowers, on a stem about three feet high, and having large leaves. It is the broad-leaved Pepper-wort (*Lepidium latifolium*). This species is not common, though several of the pepper-worts are very frequent plants on inland fields. They are all remarkable for their antiscorbutic properties, and the broad-leaved species yields an emetic on infusion. The Narrow-leaved Pepper-wort (*Lepidium ruderale*), is a more common plant on waste places near the sea, but is not confined to the coast. The Cress of our gardens, the plant in which most of us delighted in childhood, because the vegetable crop appears so soon after the sowing of the seeds, is the *Lepidium sativa*; and commonly as this plant has long been cultivated, its native haunt was unknown until Dr. Sibthorp found it growing wild in Greece. Some species of the Pepper-wort were of great value to the ships' crews under Captain Cook, when they were suffering from diseases incident to a long abstinence from vegetable food; and one species is in common use among the South-sea islanders, for intoxicating fish, when they may easily be taken, even with the hand.

The Sea Radish (*Raphanus maritimus*), though not a frequent production of the English shore, yet grows on Beachy Head and in Cornwall, is very abundant on the cliffs from the Lizard to Kennack, and is a most common plant on the western shores of the outer Hebrides; it has large, pale-yellow flowers, and very rough leaves. Probably a person but little acquainted with wild flowers would consider it to be a species of wild mustard, for it is much like those weeds.

The Hare's-ear Treacle Mustard (*Erysimum orientale*), is another cruciferous plant of our cliffs, and is very general all along the shores of Southern Europe. It has cream-coloured flowers, and glaucous leaves. Two kinds of Rock-cress (*Arabis*) also are found near the sea; but, like the Hare's-ear Treacle, they are rare flowers, and difficult to describe.

A very pretty and fragrant flower, which in summer time we are glad to welcome to our gardens, for its sweet, honey-like scent, is the Sweet Alyssum, or Sea-side Koniga (*Koniga maritima*), and it is found on the cliffs by the sea near Aberdeen, and at Budleigh Salterton, in Devon; but it is probably not a native plant. It is very plentiful on the shores of the Mediterranean, and its seeds were perhaps borne hither by the waves. Its flowers are large and white, and it has long, slender, hoary leaves. It flowers in August and September. The whole tribe of Alyssums were reputed by the ancients to have the power of allaying anger; but we, in these later days, trust rather to moral remedies for the cure of this ill, than to any "herb of virtue."

On many parts of our coast the Grass-wrack

(*Zostera marina*) is very abundant, growing in thick clumps, on sandy shallows and banks in the sea, and on stormy days being dashed in large masses on the shore. One would call it a sea-weed, were it not that this mode of fructification excludes it from that tribe of plants, and connects it with maritime, rather than marine, vegetation. It has very long grass-green leaves, and hence its botanic name is derived from the Greek word riband. The French term it *La Zostère*, and the Germans Seatang; and our coast people commonly call it Seagrass. It abounds on the shores about Yarmouth, and it is there torn up by the waves, and thrown ashore in such quantities as that it is used to heap up into mounds, to serve as a sort of wall for resisting the encroachments of the sea upon the land. It is also used for thatching roofs, and in one respect it serves this purpose better than hay, as sun and wind do not decay it; and a seagrass thatch is said to last a hundred years, though the sun soon deprives it of its rich green hue, and bleaches it white. The Dutch and Swedes use this plant more than we do, for they strew it largely over their land for manure; and in all the countries of the north of Europe it is not only used for stuffing beds, but it is preferred to almost any other material. It is sold in our shops for filling mattresses, cushions, and other articles of domestic use, under the name of *Ulva marina*. The rush-like envelopes of the Italian liquor-casks are made of Grass-wrack, and it is very much used for packing glass bottles and earthenware. The leaves require to be steeped in fresh water, and well dried before using them for bedding. A good quantity of saccharine matter is found in the lower

part of the stem, which is of a reddish-brown colour; and the Highlanders chew this part of the plant, and deem it very nutritious. Horses will feed on it, but cows are not fond of it. Pallas found it among the pottery in the old tombs in the south of Russia.

Any one who knows that large and singular plant, not uncommon on our heath lands, the Great Broom Rape, would at once recognise, should he happen to see it, the much rarer species of our shores, the Red Broom Rape (*Orobanche rubra*). Though seldom found on the English coast, it is frequent upon the basalt and trap rocks in the Hebrides and the adjacent shores of the mainland. It grows also on some maritime spots of Ireland. The broom rapes are numbered among our few native parasitic plants, as most of the genus grow on the roots of the furze or broom of our heath lands; and so parasitic in habit are some of the tribe, that the seeds of the Branched Broom Rape, which grows on hemp, are said to lie inert for many years, unless they come in contact with the roots of their chosen plant, when they will immediately flourish. So too the introduction of the broom and gorse into a neighbourhood, has soon been followed by the luxuriant growth of the Great Broom Rape, which sprang up on their roots. It is no wonder that they, long since, received their name from two words signifying a vetch and to strangle; and they are in as ill repute as ever for destroying the plants on which they grow, and have several names used in country places expressive of the idea which the peasantry entertain of their injurious effect. They are all so acrid also in their nature as to be refused by cattle. The Red Broom

Rape has purplish-red flowers, and stem of somewhat similar hue, tinged with yellow. It has no leaves, but a scaly stem. Very similar, and equally rare, is the Purple Broom Rape (*Orobanche cærulea*), which grows in grassy pastures, near the sea, and is parasitical on the roots of other plants.

A very pretty little bulbous flower of the genus Trichonema (*Trichonema columnæ*), which is one of the beautiful Iris family, and the smallest of them all, has been found on one or two spots on the southern coast of England. Here and there, too, on grassy sandy places, near the sea, one of our three species of wild flax (*Linum angustifolium*) rears its pale-blue erect bell, in June and July; and rare as are primroses, save beneath the shadow of woodland boughs or in mountain solitudes, yet there is one kind which graces the shore. This is the Scottish Primrose (*Primula Scotica*), and a very lovely little flower it is. Primroses generally seem fearless of cold winds. We know how they come out by thousands in our woods, when the wild winds of spring are not yet soothed into summer stillness, and the traveller on the high hills stoops down to smile on them amid the mountain snows. The breezes which play around the Orkney Isles are none of the mildest, yet they often bow down the blossoms of this Primrose; and rare as it is elsewhere, it is frequent on the northern coast of Sunderland, and has been gathered from the north coast of Caithness. It is so different from other primroses, and so peculiar to the shore, that the reader who should happen to find it, might easily know it. It has a deep bluish purple blossom, with a yellow centre; and though a stout and sturdy-looking plant, its flowers are small. Its

leaves are mealy, and it is much like the Bird's-eye Primrose of the mountainous pastures of the north of England, which, though rare in most places, is not unfrequent in Yorkshire.

The Sea Stork's Bill (*Erodium maritimum*) is a little rare sea-side plant which grows among the sands in some parts of the Welsh coast, and on the southern shores of England. It flowers from May until September, but its little pale red petals seem no sooner to make their appearance than the wind carries them off, and it is difficult to find specimens in full flower. Like the other storks' bills, its seed-vessels have so great a resemblance to the beak of the stork as to enable any one to recognise it by their form.

Several pea-shaped flowers grow on our shores, but the Sea Pea (*Lathyrus maritimus*), which thrives on stony beaches in several parts of the eastern and southern shores of England, as well as on the coasts of the Shetland Isles, is the largest and prettiest of them all. It bears a good many purple flowers, finely veined with crimson, and it yields enough leaves and stems to be a welcome food to cattle; while its long and deeply-spreading roots are almost as useful in binding down the sand as are the mat-grasses. The seeds are of bitter flavour, yet they were once very valuable as food to many when England suffered from famine.

Another pea-shaped flower, the rough-podded Yellow Vetch (*Vicia lutea*), is found on rocky or stony ground, especially near the sea; but it is not confined to the shore, and is not a common flower. It has large blossoms, growing singly. It is abundant about the rocks of Dunure Castle, and

on the hills of Queensferry, but seems confined to that part only of the neighbourhood. It grows also in Suffolk and Sussex, and on some Scottish shores. Then, too, the smooth-podded Vetch (*Vicia lævigata*), with its pale blue or whitish flowers, has a liking to the sea, and blooms in July and August on the pebbly shore of Weymouth in Dorsetshire; and the rare rough-podded purple Vetch (*Vicia Bithynica*), with its pale purple wings, is to be searched for in maritime spots, as it grows there more often than elsewhere.

Every one has rejoiced in his country walks at the sweet scent of the clovers or trefoils of our meadows, and the bees rejoice over them too. Our purple sweet-scented clover does not send up its odour mingled with that of the salt wave, but large patches of the white or Dutch clover (the Irish shamrock), lie upon the beach; not because this clover thrives best near the sea, but because it is hardy enough to thrive anywhere. We have besides trefoils peculiar to the coast, and such as may properly be called maritime species, but they are not very frequent flowers. The Teasel-headed Trefoil (*Trifolium maritimum*) is found in June and July in salt marshes on the eastern and southern shores of England. It is of a pale reddish purple colour. On the sea-coast of Sussex, between Shoreham harbour and the sea, the very beautiful species called the Starry-headed Trefoil (*Trifolium stellatum*) is said by Sir William Hooker to grow in great abundance. It is a singular and elegant species, with long calyces or flower-cups, and while young the small cream-coloured flowers are almost hid among their straight bristly teeth, till becoming larger they open into a beautiful starry shape,

and assume a degree of redness. The rough rigid Trefoil (*Trifolium scabrum*) is found also on the Scottish coasts, as well as on sandy inland fields in England; and sometimes, but rarely, that little

TREFOILS.

inconspicuous flower, the Suffocated Trefoil (*Trifolium suffocatum*) gratifies the botanist more than the ordinary lover of wild flowers, by springing up under his footstep, as he walks along the Norfolk or Suffolk coast.

The reticulated Medick (*Medicago denticulata*)

is another little plant which the maritime botanist looks for in June on some coasts. It has been found on exposed sandy shores in Kent, and also near Weymouth. We have several wild kinds of medick in our fields, and on our way-sides. They are all pea-shaped blossoms, remarkable after flowering, for their broad flat sickle-shaped pods, in some species twisted spirally. The flower of the sea-shore medick is like those of most of the genus, yellow; though our common lucerne, which is a species of this tribe, has pale purple blossoms. The French call this *Foin de Bourgogne;* it was highly extolled by the Roman writers as a good plant for fodder, and is grown both in this and in continental countries. Another of the tribe, called the Moon Medick, was the Cytisus of the ancient writers. It grew in the country of the Medes, and hence probably we derive the name Medick.

The Cotton Weed (*Diotis maritima*) is common enough on some of our sandy shores in the east or south-east of England, though not sufficiently general to be much known to any but botanists. It is an autumn flower, and one which many would overlook, for its little yellow blossoms are almost hidden by the flower-cup. It well deserves its English name, for it is really covered with a cottony down. Hence Linnæus called the flower *Filago,* because it was enveloped with a delicate thread, *fila.*

The Sea-wormwood (*Artemisia maritima*) grows along the shore and on the salt marshes in its neighbourhood, and is bitter enough to remind us of the Scripture expression, which marked this as the most bitter of plants. It has in one variety

drooping brownish flowers, and in the other erect blossoms, and both varieties may often be found growing together. Like other species of the wormwood, it was formerly much used in medicine, and a superstitious veneration attached to it. One kind of wormwood, the Common Mugwort (*Artemisia vulgaris*) of our wayside and waste places, was so much valued by the older botanists, that Pliny told of it that any one who carried it could be hurt by no poisons, nor by any wild beast, neither yet by the sun itself. The sea-wormwood has downy leaves, and it flowers in September.

A plant with a brighter, gayer flower, adorns the salt marshes on the south and west shores of England and Wales. This is the Golden Samphire, or, as it is sometimes called, Samphire-leaved Fleabane (*Limbarda crithmoides*). It is about one foot high, and bears single flowers on its branches of a bright yellow colour. In some parts of France it is called Limbarde; and there, as with us, its fleshy leaves and stems are taken to the markets to be sold as samphire; but it has none of the aromatic virtues of the plant whose name it resembles.

The Sea-side Feverfew (*Pyrethrum maritimum*) is common on many parts of the sea-coast, but is probably only a maritime variety of the common May-weed, so abundant everywhere. It may be distinguished from the sea-side camomile (*Anthemis maritima*), to which it is very similar, by the faint odour of the latter plant. This camomile; too, has cream-coloured rather than white rays. It is almost peculiar to the sea-coast at Sunderland. The camomile tribe have their name, *Anthemis*, from the Greek word "a flower,"

because of the multitude of their blossoms; just as the Persians call the lilac from *lilag*, their word for "a flower;" while the people of the East often use the same word for "a flower" and for "a rose," that being with them, as with us, on account of its beauty, the flower of flowers.

We have several species of knapweed in our lanes and fields, far away from the sea; and the brown radiant knapweed, and the black knapweed, with their bright lilac florets surrounding a dark rough knob-like flower cup, sometimes make the beach and other waysides gay. The Common Star Thistle (*Centaurea calcitrapa*) is one of those flowers which are more frequent on the shore of the south of England than on any other spot. It may be known by the long thick prickles, or rather thorns, which beset its round green cup. It is the *caltrops* of Virgil, and its name was given because its calyx resembles the ancient instrument of warfare, consisting of an iron ball armed with spikes. Its first appearance is like that of a thistle, but it has not prickly leaves, which thistles have. The country people call all these knapweeds "iron-weeds." Clare describes their haunts—

> "And iron-weed, content to share
> The meanest spot that Spring can spare;
> Even roads, where danger hourly comes,
> Are not without its purple blooms."

None of our true thistles are maritime plants, though several of them raise their rich purple blossoms near the shore, or in any other wayside or chalky soil. The slender-flowered thistle (*Carduus tenuiflorus*) flowers in July, especially on the

waste sandy places near the sea. It has numerous pale purple flowers, and is not one of the most beautiful of the tribe, though spiny enough to remind us of the Scotch motto, "No one touches me with impunity."

We find nettles every where, whether by lane or woodland, by ancient ruin or on open shore. But the most venomous of all our British nettles is not a common species of inland growth, and is oftener found by the sea than far from it. This is the Roman nettle (*Urtica pilulifera*), which has large leaves, on long thick stalks, and four-sided stems. If all our nettles were like this, they would well deserve their name, taken from *uro*, to burn, for the pain inflicted by its sting does not easily pass away. Like its companions, however, it in some measure atones for its venom by the uses to which it may be applied. Very good cordage is made of nettle fibre, and in Scotland the plant is frequently eaten as food. Indeed, the boiled tops of the young nettle are no despicable table vegetable. There are writers who greatly recommend the culture of our larger species of nettles for forage; and it appears that the common large nettle (*Urtica dioica*) has yielded a good supply of food for cows, by being planted in rows. A singular purpose, too, to which nettles have been applied, is that of stopping the leaks of wooden vessels. Some handfuls of the green nettles are rubbed over the joinings of the staves, into these the juice penetrates, and coagulating there, forms a barrier to the escape of any of the contents of the vessel.

Almost every one knows the common Sun

Spurge, often growing as a weed in gardens, and called in villages Churn-staff, or Milk-weed, because of its acrimonious milky juice, This belongs to a family containing fourteen native species, three of which are maritime plants. The Purple Spurge (*Euphorbia Peplis*), with its oblong, heart-shaped leaves, and yellow greenish blossoms, is to be found flowering from July to September, on the sandy coasts of Cornwall and Devon. It may be known from most other species by its stems, often tinged with a deep purple tint. Like the sun spurge it contains a quantity of milky juice. Indeed, this corrosive secretion is common to all the spurges, and it is so acrid, as that if not carefully applied it will blister the skin. Village people, however, make much use of the juice, not only for curing warts, but they even venture to apply it to the mouth in cases of tooth-ache, or rub it behind the ears to raise a blister, which it will certainly do very quickly. The different species of this plant were once so valued as a medicine, that the name of the first physician who used them was gratefully recorded by it; and Euphorbus, the physician of Juba, King of Mauritania, has been thus remembered for many centuries by those who were learned in medicine and surgery. The spurge of the *Materia Medica* is a native of America, and so powerful is its milky juice in corroding the skin wherever it touches it, that persons who collect it are obliged to tie a cloth over the mouth and nostrils to protect them from the acrid dust of the withered branches, which causes sneezing. The two remaining species of spurge which are to be looked for on our

coast are, the one termed Sea Spurge (*Euphorbia paralia*) and the Portland Spurge (*Euphorbia portlandica*), but they are not common plants, and are confined to a very limited portion of our island shores. The former has been found at various parts of the English sea-coast, and the latter on the sandy sea-shores to the extreme south and west of England, as well as on the Welsh shore, on the Isle of Man, and a few other places. Sir William Hooker remarks of this, that it is very rare, if not unknown on the Continent.

Two of our native plantains are common near the sea, the one on the salt marshes, the other on the beach, growing down among patches of grass or little loose mounds of sand, just beyond the reach of the waves. The sea-side plantain (*Plantago maritima*) is very plentiful on saline pasture lands and in the clefts of rocks, and indeed sometimes it grows on a sandy spot on the beach. It is also found, like several other of our maritime plants, on the summits of high mountains. Most persons are familiar with the plantain whose brown spike is gathered for birds, and which has the old name of Way-bred; and this is much like it, save that it has not the broad leaves which our forefathers used for binding over their wounds, but has long narrow foliage. Few plants, however, vary more than this, under different circumstances of soil and situation. Sometimes the leaves are scarcely an inch high, while in a soil where it seems more thriving, they are often a foot long.

The Buck's-horn plantain (*Plantago coronopus*) grows chiefly near the sea, and is often one of the commonest plants on the beach. Its leaves are

cut into many segments, and lie in great profusion close to the ground, all round the stem. The flower is like all our other plantains, a greenish spike. There is no doubt that the leaves were formerly used in salads; but they are, in the opinion of the author, very unpleasant in flavour. A rather conspicuous plant, the Mountain Garlic (*Allium carinatum*), with dull-coloured yellowish or brownish white flowers, may be found in July on sandy grounds on the south-east coast of England, and on one or two spots of the Scottish shore. Its leaves are long and slender. Its odour forms no pleasant addition to the scent of a wild-flower nosegay, but all the garlics were once highly prized for remedial virtues, and they were thought, Fuller says, to be "Soveraigne for men and beasts in most maladies," though, as this excellent old writer adds, "the scent thereof is somewhat valiant and offensive."

The Knot-grass, growing on many beaches, is by most writers thought to be a distinct species from the common knot-grass of our every way-side. The *Polygonum maritimum* is a larger plant than that, covering some feet with its long woody stems and branches, and making many a green patch on which animals who may stray thither may make a sweet repast.

On the south and south-western shores only of England, and on some parts of the Irish and Welsh coast, may be found the lesser Wart-cress (*Coronopus didyma*), with its cut leaves and dense masses of small white cruciferous flowers. It sufficiently resembles the common swine-cress, or wart-cress of our inland waste places, to be identified by one

familiar with this common plant. The latter species was in former days in much use as a salad, but its pungency is not agreeable to the taste of modern days. Both species have leaves something like the foot of a bird, hence their botanic name was formed of the two Greek words *crow* and *foot*. They grow round the stem in such a manner as has led to their familiar name, "The Star of the Earth." On the beach of Dovor, the common wart-cress is abundant; we might find a hundred plants in five minutes' walk. Both kinds have seed vessels beautifully crested with minute tubercles.

A far more showy, and indeed a beautiful flower of our salt marshes, is the Marsh-mallow (*Malva officinalis*), with its soft downy greyish-green leaves, and large blossoms of a delicate rose-colour. This plant is thought to be the *Hibiscus* of Virgil, and has been used medicinally in all countries in which medicine has been cultivated. The mucilage contained in every part of the plant renders it valuable, and so much of this is contained in the roots that when they are boiled in water they give out half their weight in a glutinous substance, which is thought to be nearly allied to gum arabic or starch. The Marsh-mallow is very rare on Scottish shores, and indeed is not plentiful on the English coast, but it is one of the prettiest of all the flowers of the salt marsh.

We might tell of one or two ferns which, like the sea spleenwort (*Asplenium marinum*), festoon the sea-caves and clefts of rocks with their firm dark green fronds, or leaves, as the unscientific would term them; but they are so difficult to

describe without the use of botanic terms, that we must leave them to glance at the fern-like *Equisetum*, or horsetail of our coast. It is classed with the ferns, but none but a botanist would discover its resemblance to that interesting tribe of plants. It has not a bright green leaf, studded like them with dense masses of brown fructification in masses, which when seen under a microscope, seem groups of crystals and other gems; but it has rigid hollow stems, without branches or leaves, and with black sheaths at intervals around it. The variegated horsetail (*Equisetum variegatum*) has been found on some sandy shores of England and Ireland, and also on the sands of Barry in Angusshire. It is the smallest of our native Equisetums, its stem being rarely more than eight inches high. Every one knows the tall stems of some of these plants, which grow on the marshy or boggy places of our lands, with their long whorls of rigid furrowed branchlets. They may well be so hard as to have been used so much in polishing ivory and wood and metals, for they have a framework of flint. If some species of the horsetail be carefully burnt, some remains will be left unconsumed by the fire, and if these are held up to the light, numerous little points will be seen spirally arranged, which are portions of pure flint, and it is the saw-like flinty edge which renders the plant so useful a polisher. Its old name was pewter-wort, for good housewives in the olden times used it in brightening the ware, on which once the good roast beef of Old England disdained not to rest.

The Equisetums are an interesting tribe to the geologist, for they appear to have formed a very

considerable part of the original vegetation of this world of ours. In modern days they are but a few feet in height, but once they were tall plants many yards high, or gigantic species more like trees than herbaceous plants; and the strata of the coal-fields exhibit Equisetaceæ, beside which our modern horsetails dwindle into insignificance.

CHAPTER II.

SEA-WEEDS.

"The floor is of sand, like the mountain drift,
And the pearl-shells spangle the flinty snow,
From coral rocks the sea-plants lift
Their boughs where the tides and billows flow;

The water is calm and still below,
For the winds and waves are absent there;
And the sands are bright as the stars that glow
In the motionless fields of the upper air.

There, with its waving blade of green,
The sea-flag streams through the silent water;
And the crimson leaf of the dulse is seen
To blush like a banner bathed in slaughter."

PERCIVAL.

SOMETHING of the loveliness which the poet describes, may be beheld in the salt pools among the rocks, those miniature seas which on some shores present us with a little world of beauty. It would be difficult to linger gazing into these hollows, when the summer sun shines down upon them, and through their clear waters we see the dense silky tufts, or the waving branches of sea-weeds, without forming some picture in the mind of the scene presented by the ocean bed. But if we could sail away a little from the shore, where the water is clear and still, or yet better, if we could glide over the blue waters where the base of a deeper sea would reveal itself, we should espy masses of vegetation grouped in graceful forms, and intermingling their boughs together, like the

forest trees which group themselves now on many a bright spot of earth, over which, as geologists tell us, ocean itself once flowed. The dancing waves carry the long leaves backwards and forwards, and not a weed is there but some living creature of wonderful and beauteous structure is there too to enjoy it. We speak of the uses of sea-weeds, and the God who has given to man "the sea and all that therein is," designed them in some measure for his service. But we make only a faint estimate of the worth of marine vegetation, when we think of sea-weeds but as contributing to utility by their use in dyes and manufactures, or in affording nutriment to us. They belong more especially to the myriads of creatures which inhabit the great deep. They are their homes, their couches, their sources of food. It is wondrous to reflect, that the worlds of water contain far more of animal life than exists on this green earth, or in the air which surrounds it; for besides that a much larger portion of the globe consists of water than of land, the seas are inhabited in their depths. Few are the terrestrial creatures which, like the mole, know not the worth of light, and can make their homes beneath earth's surface, unmindful of its darkness. The millions of animated creatures which float on air, or walk or creep over glade or mountain, dwell on the external portion of earth. But a great part of the depths has its living inmates, and the Psalmist expressed his sense of their multitude, when he said, "Therein are things creeping innumerable, both small and great." There they live and die, in a home suited by the great Creator to their wants and capacities of enjoyment. Nor is it all a home of darkness. The deep has its

glowworms, bringing their tiny lamps to make it luminous, and carrying in their track a gleam of brilliant light. There are, probably, few marine animals which are not more or less indebted for their sustenance or enjoyment to some of the numerous sea-plants, which lie beyond our ken in the world beneath the waters. Every one of these has its appointed dwelling-place and provision, from

"The aspiring fish that fain would be a bird,"

down to

"The Zoophyte,
That link which binds Prometheus to his rock,
The living fibre to insensate matter."

But amid this store of living creatures, Death has a work to do, and millions are born to live but a few hours or days. In this vast basin, whose every wave contains living things,

"Countless as sunbeams, slight as gossamer,"

and in whose waters move also the monsters of the deep, dead animal substances lie or float, whose putrefying remains would spread poison on the air above and around the sea, and gradually diffuse that poison to earth's farthest limits. The sea air, which now brings health on its breezes, would carry disease and death, were it not for the scavenger-like animals which prey upon its refuse, and for the sea-weeds, which, with continual and rapid growth, cover every part of ocean's bed. Their large tough and woody stems, crowned often with gigantic fronds or leaves, assimilate to their own support the masses of putrescence, arising both from this source and from the substances constantly carried by every tide from the shore. The decay

of these sea-weeds, in their turn, renews the soil of ocean bed, by means of which it gradually rises. And thus the lovely and picturesque plants of the sea, aid with the rushing of the waters, and ebbing and falling tides, and with the saltness arising from the deposits of saline matter in the channels of the deep, to change, what else would be evil into good, and to spread purification and wholesome air, instead of poison.

The number of British sea-weeds is about three hundred and seventy, and of these many need the aid of a microscope to discover their beauty of structure. Growing both in salt and fresh waters, or forming crusts on rocks, or sea-caves, or on inland moist places, are to be found tribes of *Algæ*, which seem formed of little riband-like particles, which, when subjected to microscopic investigation, startle and puzzle the philosopher, at one moment appearing to have animal, and at another vegetable life; or resolving themselves into those links, between the two kingdoms, those tribes, half plant, half animal, which until the recent improvements in the microscope, have lived through countless generations, unknown and unsuspected. Some of the *Oscillatoria* tribe are found in salt waters, for they exist wherever there is water, though more abundantly in ponds or rivers, or on moist places, than in the sea; and naturalists know not whether to regard them as plants or animals. Adanson was the first who discovered their singular movements, which have since much interested men of science. They often form crowds of filaments of greenish or brownish tint, each pellucid thread having a diameter of about the thousandth part of an inch. Now they assume the crooked windings

of the letter S; now they are perfectly straight; and the next moment finds them twisting themselves up in various contortions, either with slow or rapid motions. When these oscillatory plants are fully grown, their movements cease; but the young fibres exhibit them, not only while in water but when taken out and laid on a plate. These plants are of most rapid growth, acquiring ten or twelve times their length in so many hours. They grow and increase like vegetables, but when burnt yield the odour of decaying animal substances. Still more wondrous is that tribe of microscopic Algæ, called the *Diatomaceæ*. Many of these are marine, and are to be found in all seas; even the melted icebergs yielding masses of them. Thousands of these minute plants are contained in a drop of water, yet every little plant has a beautiful structure of flint, and exhibits a most singular conformation. Some of the delicate silk-like or velvety tufts of the Algæ of the seas, when examined, seem like strings of beads; some like tubes of glass filled with bright colouring matter; others composed of networks finer than the finest cobwebs; some like little bunches of slender hairs; others branched, like minute trees of emerald green or sparkling brown, or rivalling the rose and violet in richest hues. We might linger over descriptions of the minute wonders of this tribe, and tell how some small plants have filaments consisting of two tubes, one of which is exterior and so transparent that it might be compared to a tube of glass. Within this lies a jointed tube, filled with colouring matter, often almost imperceptible, but occasionally of most brilliant green or purple, or faint yellow tint; and pointing from these won-

drous things to the great Maker of the universe, we might exclaim with Job, "Lo, these are a part of his ways, but what whisper-word is heard of him!"*

But in this chapter our business is not so much with the unseen as with the visible. It is not of the hidden wonders of ocean that we must tell, but leaving the less known forms of *Algæ*, we must proceed to describe some of the most common kinds of our sea-weeds, in such simple manner as may enable the wanderer by the shores of our island to recognise the forms most familiar to the eye. And attempting no scientific classification, we shall simply divide the sea-weeds into the three great groups into which botanists arrange them, which are the olive-green, the red, and the green sea-weeds.

At almost any part of the year we may find on our shores abundant specimens of some of the coarse olive-green sea-weeds, the *Melanosperms* of the botanist. There they lie, all withered up by the sunshine, or fresh and tough as they have just been dashed up on the shore,

"Hurl'd out of darkness by the uprooting surges."

The piers about the sea are blackened by some of them, and their long fronds are beaten by the waves which fall upon the rocks on the beach. The name of flags, derived from their flagging and drooping positions, is frequently appropriate to these sea-weeds, and often for miles along the rocky coast, the distant scene seems black by the profusion of their olive fronds, which, when

* A learned writer thus renders Job xxvi. 14.

the sea comes up with its high tide, no longer droop heavily, but float and play with every wave.

Every one accustomed to the sea-side, or even to the shores of salt rivers, knows that most common of all sea-weeds, the Bladder Fucus (*Fucus vesiculosus*), whose dark sprays lie on every line of sand or shingle, or gather in clumps on rock or pier. When fresh from the waters, it is of a dark olive tint, but as it hardens in the sun it becomes black as ink. Its frond has on it, here and there, a number of oval bladders or pods. These are the air bladders, which enable the fucus to float on the waters; and these occasion the crackling noise, when, as we walk upon the shore, we crush the half dried sea-weed by our footstep. As this plant dries, it becomes covered with a whitish salt crust. It has the common names of Bladder-wrack and Sea-ware, and was formerly very generally called Sea-oak. The Scotch call it Kelp-ware, or Black Tang. Its fronds, when near the shore, are generally about a foot long, but when found in deeper water, they are larger and more abundantly provided with the air vessels, by means of which they wave about in the sea; and large branches, four or even five feet in length, may there be gathered. The frond forms numerous young plants about its roots, and if torn, it will throw out new shoots from the injured part. In Gothland it is a famous food for cattle when boiled and mingled with meal. Cattle are also fed on some other of the fucus tribe, and in some of the Scottish isles the animals go down regularly at low tide to feed on this refuse of the waves, guided by that instinct, which teaches them so surely, as that they never mistake the time of its ebbing. This is also much used for

manure. We may see in England the little cart, or the larger wagon, loaded with these dark tinted weeds, wending its way along some of the green lanes in districts near the sea, and about to deposit its load on the land. But in Ireland this kind of manure is often the only one which the poor man can procure, and the storm which brings up from the ocean depths the large masses of fuci, is often a source of comfort to the Irish peasants, who gather on the shore in large companies, at such seasons, in order to appropriate the store of the sea. Dr. Greville states that the dried frond is used for fuel in several parts of the North, and that in the Hebrides cheeses are dried without salt, by means of the ashes procured by burning this plant. These ashes contain half their weight in alkaline salt. Its bladders also yield iodine, the quantity of which is said by Sir Humphry Davy to vary according to the climate under which the plant grows; for this sea-weed, unlike our other common fuci, has a wide range, and flourishes within the Arctic circle, and lifts a smaller frond to the waves which beat on some tropical shores. It was from this plant that Dr. Russell procured the black salt powder, called Vegetable Ethiops, which has been used in medicine, and is also an excellent dentifrice. The frond of the bladder fucus has a rib or vein up its middle, and air vessels, from the size of a pea to a hazel nut, in pairs, scattered irregularly over its substance.

Another of the very common fuci is the Prickly Tang, or Saw-leaved Fucus (*Fucus serratus*), which is as frequent as the bladder-wrack, and much like it; the length of its fronds varying from two

to six feet. It may at once be known from the former species by its notched or serrated edges, and by having no air-vessels. It often covers the rocks to the limit of low water. Our engraving represents it in the condition in which we often find it, as the place of attachment to various para-

sitic objects. The thread-like coralline, and the rough crust are two zoophytes, which will be described in a future chapter; and the little circular shell-like substances are the structure and dwelling places of that singular and minute worm the spirorbis. They have not, like true shells,

varied markings or brilliant tints, and they are attached by their flat sides to the sea-weed; but the beautiful animal within, when seen under the microscope, excites our admiration by its symmetry and grace; and its shell-like case was secreted, like the home of the mollusk, by its outer covering or skin.

Another of the most common of our marine plants, and one of our largest kinds, is the Knobbed or Knotted Fucus (*Fucus nodosus*). It is a thick, leathery plant, of an olive-green, often almost yellow colour, when fresh, but when dried, of a black hue, and polished like ebony. It may easily be known by its long stem, which swells at intervals into large bladders, in fine specimens an inch and a half in length, and looking altogether like a string of beads. The air-vessels are said to be used, when highly polished, for necklaces. It has, when in fructification, orange-coloured pods, on little stalks; hence the people of the Orkney Isles call this plant Yellow Tang. In Norway its large air vessels acquired for it the name of Knop Tang. These bladders are admirably adapted to the condition of the plant, for it is coarse and heavy, and when growing in deep water, it is seven or eight feet long; so that the stormy winds, which upraise the waves, dash it with great violence against the rocky peaks. Were the bladders of more delicate structure, and frailer substance, it must inevitably be torn to pieces by the force of wind and waves. Were they like those of the Bladder Fucus, which break by a gentle pressure of the finger, they would not suit this plant. But the Bladder Fucus grows in a flat branch upon rocks, and needs not the provision of a stronger fabric. The Knobbed Fucus is known

on some parts of the coast of Scotland as the sea-whistles, because boys make bladders of its large air-vessels. If these are thrown into the fire, they burst with a loud report.

One more Fucus only is very common on our shores. This is the smallest species, and called the Channelled Fucus (*Fucus canaliculatus*), from its

channelled stems and branches. It has no air vessels, for it does not need them, as it grows on the rocks, about the high-water mark, and on

spots where the ebbing of the water leaves it, for many hours daily, quite open to sun and air. Sometimes it exists in a very dwarfish condition, on places where it is only spattered by the spray, except at such times as the ocean is raised by wilder storms beyond its usual height on the shore. It is seldom more than five or six inches high, and when in fructification, its pods grow in pairs at the end of its branches. It is a favourite food of cattle. Sir J. E. Smith says, that they never fail to browse on it in winter, whenever the receding tide leaves it free of access to them.

There are, besides these, two other species of Fucus, belonging to our British genus, of that name, but they will be left unnoticed as not being common plants. All these species, as well as some other of the olive-coloured sea-weeds, are burned for kelp, for the service of the glass and soap manufactories. The Knobbed Fucus seems the most valuable plant for this purpose; but the serrated species, as well as some kinds of those large, leaf-like marine plants, called the oar-weeds, contribute also to the kelp-burning. Time was, when this preparation of kelp was a source of livelihood to many; but among the changes which have been made by the improvements in chemistry during late years, other means have been found of procuring soda by a less expensive process, and the kelp burners have had little to do. The weeds, when intended for kelp burning, were cut from the rocks, or gathered from the shore by men, women, and children, and laid in the sun to dry. They were then made up into little mounds, till the summer was over, when they were thrown into pits, where they were lighted and left to

burn. They thus formed cakes of ashes, which were in this state sold; and Dr. Drummond remarked a few years since, that almost the entire rent of the Island of Ratlin, on the northern coast of Ireland, was paid from the produce of sea-weeds; and added, that from this source alone, the rents of a Highland chief had of late years increased 2,000*l.* per annum. The picture drawn by his brother, Dr. William Drummond, of the Highlanders engaged in that occupation, is such as to make us feel regret for that individual injury, almost always sustained, on the accession of any public benefit. He thus describes them:-

> "A race inured to toil severe,
> Of manners simple, and of heart sincere;
> Sons of the rock, and nurslings of the surge,
> Around the kiln their daily labours urge;
> O'er the dried weed the smoky volume coils,
> And deep beneath, the precious kali boils."

The growth of these sea-weeds is remarkably rapid, so that in a few months they will cover with a dark vegetation the barren rocks on the shore over which the white sea-wave dashes. So readily do they increase, that on some parts of the coast where the plants are not naturally abundant, they have been raised by merely placing stones at intervals, close to the sea. In a short time these sea-weeds yielded to their owner a plentiful crop. Scotland and its adjacent islands are stated, at one time, to have furnished no less than 20,000 tons annually of kelp, made from the coarse marine plants.

An anecdote related by Neill, is quoted by Dr. Greville, and, indeed, by many writers on sea-weeds, and well illustrates their rapid growth.

A stone beacon was about to be erected on a low rock, near the entrance of the Frith of Forth, called the Carr Rock. This is about twenty feet broad, and sixty feet long, and before the commencement of any operations, was blackened by dark masses of sea-weed, particularly of the Digitate oar-weed, and Esculent alaria, which were only left uncovered at the lowest ebb of spring-tides. In the autumn of 1813, a great part of the foundation for the proposed beacon had been levelled, when it was found necessary for a time to relinquish the project. The sea-weeds had then been cut away, and their roots trampled down by the workmen. In May, 1814, the work was resumed, and great was the surprise of the engineer, at finding that the surface of the rock was again dark with its marine vegetation, and that the long olive leaves were waving to and fro in the waters. Little more than six months had expired since he saw the rock naked and barren; now freshly grown leaves of the alaria, six feet long, and the specimens of oar-weed about two feet in length, seemed waving their flags of triumph over their old dwelling-place. It was evident that they had grown from seed, for they were flourishing over the soil whose surface had been so completely cleared in the autumn by the pick and chisel.

The different species of Fucus have a variety of uses besides those already mentioned. The poor Icelander, who can command no wealth, but who can still with patriotic gratitude look on his country, and say, "Iceland is the best land on which the sun shines," makes use of many sea-weeds, and the commonest kinds on his shore

serve him for mattresses. The Bladder Fucus is the food of his horses, and in the winter time the cows and sheep go down to the shore to feed upon it. In Holland, both this and the Serrated Fucus are used by fishermen in packing their fish for exportation. Invalids who resort to our own shores for the relief of glandular affections, derive benefit both from the outward application of the Bladder Fucus, which contains the principle of iodine, and from the iodine which they inhale with every breath which they draw by the sea-side.

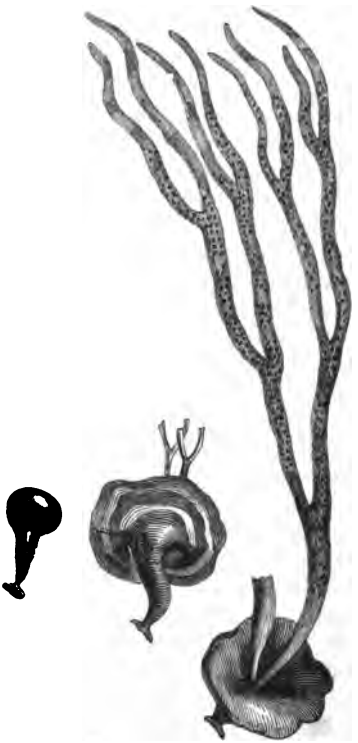
But nowhere is sea-weed an object of greater interest than in the Channel Isles, where the gathering of these plants from the rocks is made the subject of frequent legislative enactions. At all seasons of the year, groups of women and children may be seen on the shores of Jersey, diligently collecting the dark species of fucus. It is used as a manure both in its fresh state, and after having been reduced to ashes by being burned as fuel. So general is its use as fuel, that it is only on grand occasions that coal or wood is added; and it must be on a festive day, a birth-day, or some season sacred to the "superstitions of the heart," that a coal fire glimmers in the stove of a Jersey parlour. The sea-wrack fuel makes a hot, though not a cheerful fire, even without the addition of wood or coal; and as the ashes are so useful on the land, the fire is suffered to burn by night as well as day, so that, as Inglis says, "a stranger in the country would, on an early morning ride, imagine that the Jersey farmer and his household were astir long before daybreak; for he would see the smoke curling from every farm house, and almost from

every cottage chimney." The French name of these plants is varech, and in Jersey dialect it is vraic, being somewhat similar to our common name of wrack. In the daily gatherings from the shore, the inhabitants are prohibited by their island laws from collecting it between sunrise and sunset, in order to allow some advantage to those who reside at a distance from the coast. But besides these daily gatherings from the tide, there are two times of the year called the vraicking seasons, when, at dawn of day, large parties sally from every part of the island, and rest not till they reach the shore. Merry parties they are, for though they must labour hard, yet singing gleefully to the music of the waves, they with their scythes cut away from the rocks the useful weeds, and filling their carts with them, sit down to their humble meal of the vraicking cake, made of flour, milk and sugar, and to other articles both of eating and drinking which they carry with them. The carts proceed as far as the tide will admit; but boats carry the vraickers to the more distant rocks; and the stranger to the scene is often amused at seeing the busy crowds covering the rocks and the shore, while, when the ruthless tide sets in, the carts and horses may sometimes be seen floating on the waves. The two annual seasons for gathering the weeds in this way are limited to about ten days in March, and a similar portion of the month of July; and there are many families who look forward to these labours, not only as furnishing fuel for their houses, and manure for their lands, but as the means of procuring a commodity for sale, by which clothing and other necessaries must be purchased.

On every part of the shores we may find that common marine plant the Podded Halidrys (*Halidrys siliquosa*), which lies in dark branched masses about the beach, or grows on the rocks and stones upon it. It has the common name of sea-tree, from its shrub-like appearance, and it may be known by its numerous pods, about an inch long, which grow on both sides of the stem and branches. It is of a pale olive-green, but turns quite black in drying. In Norway this plant, as well as the knobbed fucus, is called Knoptang.

On many parts of the coast, the Strap-shaped Himanthalia, or Sea Thongs (*Himanthalia lorea*), attracts the notice of those who are interested in the productions of the ocean. Sometimes we may look for it in vain for weeks on the beach, but after a storm it will lie in great profusion, and hundreds of specimens might be collected in an hour's walk. It is commonly on our coast called Sea Thongs, and this name well describes it. It is a flat olive-green sea-weed, often ten feet long, and sometimes found in Cornwall of the length of twenty feet, looking like a continuation of flat, narrow pods or seed vessels, dividing every now and then into two branches, each of which divides farther on into two more, and so on through its whole length. When in a perfect state, however, it has one peculiarity by which it may at once be known from all our other sea-weeds. It springs from a kind of cup at its base, and in the earliest stage of its growth these cups may be seen thickly scattered on the rocks in the sea, and looking just like those plants of the fungus tribe which are called Pezizas. Little projections arise from this hollow cup, after it has grown into a good size,

which gradually enlarge and lengthen into a long flat strap of uniform shape throughout. It has



on both sides small projections or tubercles, immersed in the strap-shaped portion, and plentifully scattered over it. It is of leathery texture, but

its interior is pulpy and succulent. In some cases it has a yellow, slimy substance on it: and the author of these pages having wound a piece around the hand, when gathering it up from the beach, had a stain on the fingers remaining for some time after touching it. In Orkney, where it is called Drew, it is very abundant, and it yields excellent kelp. Dr. Greville observes, that in regard to its duration it seems to commence its vegetation in the spring, and to arrive at maturity in the early part of the spring following. It turns black in drying, and requires well washing in fresh water to deprive it of the slimy substance with which it is covered. The cup is in this case the true frond, the long thongs being merely the seed-vessels, and both parts should be preserved for the herbarium by the collector of sea-weeds.

Most sea-weeds have some kind of root, or rather means of attachment to the soil on which they grow. This is merely a continuation of their leafy substance, the fixed end of the plant swelling out when it roots itself. Some have a callous disc, others a tough leathery fibre, and there are besides species of marine weeds which grow on sand, and are therefore provided with branching roots, in some measure resembling those of land plants. There are, however, some few sea-weeds which have no point of attachment, but which grow in floating masses, or individual clusters in the sea itself. The celebrated Gulf-weed is one of these. This plant, which is the floating Fucus of the older authors, is by writers of our Marine Floras always enumerated among the British plants; but all agree that it is not properly native to our shores, though often cast on them by the waves,

especially on the Orkney Islands. The Gulf-weed or Sea-grape, is the *Sargassum vulgare* of modern authors; but another species, the berry-bearing Sargasso, is also thrown up on our coast, and some writers consider these as but varieties of one species. However that may be, this floating Sargasso is a very interesting plant on many accounts. It has been found in almost every part of the world, and it floats in an immense tangling mass, covering a space of at least forty thousand square miles in the Atlantic, just within the great Equatorial current. This was the mass of weed which Columbus described as floating meadows, and these fields of sea-weed (so new a sight to the Spanish navigators) alarmed the crew of the "Santa Maria," when Columbus was guiding them to the discovery of a new world. Superstitiously regarding this obstacle as an indication that their expedition had not received the sanction of the Almighty, they had nearly, in their faint-heartedness, given up the pursuit on which they had so far entered. This part of the ocean is believed to be the portion called by the ancient Phœnicians the Weedy Sea. The English mariner still terms it the Grassy, and the Spaniard, El Mar do Sargasso. This sea extends from 22° to 36° north latitude, and from 25° to 45° west longitude, and its weeds often impede the course of vessels through them. Beyond these limits there are few pieces of the sea-weed seen, and sometimes even in the grassy sea, the vessel may float for hours and scarcely see any, till it shall at once find itself in a dense dark mass. These floating tangles were formerly supposed to have been brought by the Gulf stream from the Gulf of Mexico. Then they were supposed to have

grown on shallows in that part of the sea where they abound, and to have been rent from them by fishes. But it seems now to be ascertained that this weed has no other station than the sea itself, since among the thousands of specimens fished up and examined, no root has been discovered. It grows, therefore, freely in the open sea.

The Sea-grape is an olive-green weed, with long slender leaves, and berries about as large as a pea, from which it derived its name of Tropic Grape. Our sailors call this sea-weed Midshipman's pickle, because it is pickled in vinegar and eaten on board of our ships. It is also made into salads, in some countries of the East. Myriads of fishes and sea animals live on these masses of weeds—these ocean meadows; and though they are not firm enough to bear the foot of man, yet the birds which

> "Make voyages amidst the pathless heaven,"

find a temporary resting-place, and a pleasant food on these floating islands, and sing their thankful songs amid the waste of waters, heard only by the ear of Him, who, when He called them into being,

> "Forgot not one of his large family,
> But cared for each as for an only child."

We have five British species of the olive-coloured genus of sea-weeds called Bladder-chain, but they are none of them very common, except on the southern shores of England and Ireland. The most frequent is the Granulated Bladder-chain (*Cystoseira granulata*), which has a cylindrical stem, about as thick as a goose-quill, from two to eight inches high, with numerous branches, slender as a packthread. The air vessels form a kind of

chain, sometimes running into one another. This sea-weed is firm, leathery, and flexible in texture.

Every one has seen those grey crusted, shaggy lichens which hang about our old trees, and will readily agree that two of our sea-weeds sufficiently resemble them to deserve their name of Lichina. The dwarf Lichina (*Lichina pygmæa*) is the more frequent kind, and it grows on sea-side rocks, near

NATURAL SIZE.

MAGNIFIED.

to the high-water mark, but within reach of the waves. When the tide is out it is often left dry for hours, and it is then a black, hard crust; but the returning waves restore it to its native olive tint, and render it soft and flexible. It is common on many rocky shores in autumn, and in the West of England it is abundant. The lesser Lichina (*Lichina confinis*) forms close tufts on rocks never inundated by the waves, but on which the spray is scattered at high-tide. Its dark patches, though small, crowd and darken the rocks so as to be visible at some distance.

Most of our olive-green sea-weeds grow on rocks often left uncovered by the tide, and the majority of them disappear in the deeper water, when the base is never left exposed to the sun and air. When

the tide recedes they hang drooping down and begin to dry, but the returning waters restore their freshness. It is not in the calm summer, when the sun has been for many days shining in all its brightness, and when the breeze

> "With careering wing,
> Plays like an unseen being on the water;"

it is not then that our beaches are strewed with their numerous black fronds. But when the leaden clouds seem to give their own deep dull tint to the once blue sea, and the winds rising gradually with hollow moan sweep angrily over it till ocean's voice drowns all other of the storm voices, then the waves dash with tremendous violence against the rocks, tearing away the marine plants, and sending them out to float on the waters, to tell the approaching mariner that he is not far from the shore, or they strew them on the beach for our service or delight. Then when the storm song of yesterday seems hushed in the quietness of to-day, or is singing to us only in its low and gentle murmurs, and we can stray again by the shore, what treasures do we find there—

> "Crusted shells,
> Rich mosses, tree-like sea-weeds, sparkling pebbles
> Enchant the eye, and tempt the eager hand."

Two common plants, which may be easily described, are almost sure to be among the offerings brought to our feet by the waters. These are the Sweet and the Digitate Laminaria, or Oar-weed. The former of these consists of a frond or leaf, generally about three or four feet long, and about four or five inches wide; but when in its young state we may find it not more than two inches, while

some fine specimens are ten feet long. It has a thick tough stem, and is of an olive-green, and of leathery texture. In the young plant it is sometimes like a thin flat leaf, but when older, its edges are puckered like a frill, and it has a number of raised projections down the middle, being what botanists call bullated or blistered; while a mucilaginous substance, with which it is covered, comes off on the hand. This sea-weed has a large fibrous root, if, indeed, that can be called a root, which is never intended to penetrate the soil, but only to hold the plant fast to the surface of the rock. If we examine the fibrous root of a land plant (one of the grasses, for example), we find it adapted not only for keeping the plant firm in the ground, but also, by tapering points, and minute orifices at the extremities of its fibres, suited for deriving nutriment from the earth. The sea-weeds, however, are little affected by the soils on which they grow, and they seem to require their roots, almost entirely, as means of holding them attached to it.

The Sweet Laminaria (*Laminaria saccharina*) is called by fishermen the Sea Belt. If washed, and hung up in the sun to dry, it becomes covered with an efflorescence of a white colour, and of a flavour at once of salt and sugar, which is not, however, very agreeable to the palate. This is not the only sea-weed which deposits these crystals of sweet powder, which are in the form of needles, and which were by Dr. Stenhouse discovered to be mannite, the characteristic principle of manna, differing from cane sugar, but resembling that procured from grapes. The quantity of this mannite is very great. Dr. Stenhouse found that one thousand grains of the sea-weed, yielded, by means of a

simple process, about twelve per cent. of mannite; which Dr. Landsborough describes as very beautiful, as purely white as loaf sugar, and almost as sweet; and as having retained its properties for four years from the time of the experiment.

The Sweet Laminaria is eaten, boiled, when in a young state, but it can be the food of those only who are almost destitute of any other provision, for it is neither palatable nor nutritious, though valuable for manure, and for the kelp which it affords.

The people of Japan, according to Thunberg, call this plant Komb. This traveller found it in great abundance on the Japanese shores, and very long and broad. When dried and cleansed from impurities, it is used for several purposes, and tough as it is, it is eaten occasionally, especially when the people meet together to drink their liquor called sakki. It is cut into pieces, which by boiling become much thickened, and it is then taken with other food. Sometimes it appears on their tables uncooked, after having been well scraped and cut into slips about two inches long, which are folded in the form of a square, and tied over with a narrow slip of the sea-weed. When presents are made, about half a score, or even a score of these squares are strewed about among them. It is customary here, as elsewhere in the East, to make many gifts, and it forms part of the ceremonial to accompany them with a complimentary paper, as it is termed, which is folded and tied, and at each end of this is affixed a slip of the Laminaria, about an inch broad. It is not always easy to guess at the import of ceremonies of nations whose tone of thinking and feeling is so

different from our own; but figurative as are the language and customs of Eastern people, the opinion of Barrow is highly probable, that this practice is significant of the resources of the sea to those who choose to avail themselves of its benefits.

We have said that the Sea-belt is common every where around our island, and both this and the Tangle, or Fingered Oar-weed, often lie in heaps on the beach, ready to be carried away for the lands. Both of them, too, are brought every summer inland, by hundreds of visitors to the sea, who hang them up in their houses as hygrometers, and they afford good indications of approaching rain, by their damp flagging state when the atmosphere is moist.

The Tangle or Fingered Oar-weed (*Laminaria digitata*) is a long flat leaf of an olive-green colour, which, when young, is eaten, but after its early stage it separates into a number of segments like ribbons, from the point of the leaf, to within a few inches of the stem. Children run about the beach with handfuls of these waving ribbons, at our sea-side towns, and the first idea which one might have, would be that these plants were torn into shreds by the waves; but on examining them the edges are found smooth as if cut by a knife, and not rudely rent asunder. This sea-weed is known on our coast as the Sea Girdle and Sea Hanger. In the Orkney Isles it is called Red Ware, and the Scottish Highlanders term it Sea-wand. The dried stalks, often thick and woody, and several feet long, are burnt for fuel on the Orkney and Shetland Islands, and the fronds and stems are boiled in Nordland as food for cattle.

The young plants are also eaten by the people of Scotland and the south-west of England, and

numerous tribes of shell-fish find their food in this large plant. This sea-weed, mingled with another called the Pepper Dulse, is still sold in Scotland, or was at least a few years since. Dr. Greville remarks, that he has heard the cry in the streets of Edinburgh, "Buy Dulse and Tangle." It is only while young, that the plant is at all fit

to be eaten, for the fully grown fronds have stems as thick as walking sticks, and about as digestible. These stems become so shrivelled and hard by long exposure to the air, that knife-handles are sometimes made of them. These are tipped with metal, and when polished are scarcely to be distinguished from hart's-horn. Dr. Johnston says of the plant, "In some parts of the western isles of Scotland, it forms even a sort of soil on the pebbles of the beach, on which the natives sow barley; and as the sea-weed rots, the grain drops with it into the interstices, so that when the harvest is ready, it seems growing on a surface of polished pebbles."

We have five British species of Laminaria, all flat leaf-like sea-weeds, and it is in allusion to this that they received their botanic name from Lamina, a thin plate. One other kind only will be noticed here. This is the bulbous Laminaria (*Laminaria bulbosa*), a plant not nearly so general as the other two species, though thrown up in large masses on some parts of our coast, chiefly in the south and western shores of England, and in some places on the Irish and Scottish shores. In the Orkney Islands, where it abounds, it was long valued for its supply for the kelp-furnace, for it is so large a plant that a mass of the weed growing from a single root is often a load for a man. It has a short stem, and like most of this family, a fibrous root at first, but this swells at length into a bulb, and forms a distinction of the species. Mrs. Griffiths measured a specimen of this plant which was gathered from deep water at Torbay, and found the bulb to be a foot in diameter; while the whole fronds, when spread over the ground,

formed a circle, whose diameter was at least twelve feet. Like the fingered species, it is cleft into ribbons, but it is much larger than any other of our native kinds. Our fishermen call it Sea-furbelows, and Furbelowed Hangers, on account of the waved margin of the plant at the base, which resembles a frill or furbelow, and at once distinguishes the species from all others. It grows only in deep water, and is, on account of its size, a valuable plant for manure. It is the largest European kind.

The Laminaria tribe have been well called the giants of the marine flora, but large as are our native plants of this family, those of some other seas far exceed them. On the west coast of South America, some of the tribe are a most important resource to the poor, furnishing them, as some of them do also the aborigines of Australia, with instruments, vessels, and food. In the seas near these shores, they form a forest-like vegetation under the waters; among whose long leaves lie the treasures of the deep, the pearls of ocean, and the gems of mines: and more precious still, the forms of thousands, once gifted with light and love, which the sea shall hold till it gives up its dead.

That very singular production, known by the name of Sea-trumpet, is one of this family. When its large fronds are seen floating on the waves, the sailor knows that he beholds a sure indication of the vicinity of the Cape of Good Hope. The young Hottentots, as well as the children of the Dutch settlers, make trumpets of its long stalks, and Thunberg, who calls it the Trumpet-grass, says that the land-birds often come and sit upon it.

This plant is well known to contain a larger quantity of iodine than any European sea-weed. Iodine is the powerful remedy used in cases of those swellings in the neck termed goitre; and Professor Lindley observes, that it is a curious fact that the stems of a sea-weed are sold in the shops and chewed by the inhabitants of South America, wherever goitre is prevalent, for its cure. This remedy is by them termed goitre-stick, and appears to belong to the Laminarieæ. To the same tribe belongs also that wonderful sea-weed, called Everlasting Bladder-thread (*Macrocystis pyrifera*), which navigators have described as being from five hundred to fifteen hundred feet long, and pieces of which have, by measurement, been proved to be three hundred feet in length. It is a remarkably elegant plant, its stalks not thicker than a finger, and its upper branches no larger than a packthread, with narrow leaves, seven or eight feet long, while at the base of each is a strong air-vessel, without whose aid it could not support its great length in the waters. It has a strong root, which holds it fast to its craggy rocky home. Yet, long as it is, it can grow in water less deep than might be supposed; for as Meyan remarks, it does not grow in a straight direction from the bottom, but lies somewhat horizontally. This author observes of it, that it is distributed in the New World throughout all the zones, from the extreme north to the extreme southern point. Baron Humboldt brought it from the tropical seas, but it is found at Cape Horn of greater length than elsewhere.

There is one other British genus of Laminarieæ, containing, however, only one species, the Esculent

Alaria (*Alaria esculenta*), a plant which, though not common on all our coasts, yet on some, as the shores of Durham and Northumberland and Scotland, is abundant, and is found, though rarely, on some southern shores of England. It is indeed both general and plentiful on those parts of our isle washed by the Northern Pacific and Atlantic oceans; but wherever it flourishes it usually grows in deep water. Many people of the northern countries of Europe use this plant as food, and the Irish and Scottish peasants gather it from the rocks, and seem to eat it with great relish. Its frond is a long green leaf, but it may be distinguished from the oar-weeds by the midrib or vein up its middle. It has, besides, on its stem a number of slender leaflets from two to seven inches long, and it is these leaflets and the midrib which are eaten. We must not, however, expect to find the leaflets in its young state, as they are often not developed until the plant is a yard long. This sea-weed is of a thin substance, and of a pale yellowish green, and it sometimes attains a length of twenty feet, but we cannot find a perfect specimen, as the end of the frond is sure to be torn by the action of the waves upon its somewhat frail texture. Dr. Johnston remarks, that a botanist found on the coast of Northumberland a variety of this sea-weed, with so broad a frond that it reminded him of the leaf of a plantain-tree; while in another variety of the same coast, the frond was no wider than a common ribbon. It is called Badderlocks, or Hen-ware in Scotland, and has also in the Scottish isles the name of Honey-ware, and in Ireland that of Murlins. Sir J. E. Smith remarks, that this sea-weed has, when first tasted, a

pleasant flavour; but that it leaves upon the tongue and mouth a disagreeable crust of greenish mucus. The midrib is eaten in its raw state, but it would not easily be digested by any but persons who can take robust exercise, for it is as hard as the raw carrot or turnip of our fields, and to many its fishy, coppery flavour is very unpleasant.

Three species of Desmarestia are natives of our shores in the summer; none are rare, but one kind, the spiny species (*Desmarestia aculeata*), is a very common and elegant sea-weed of most parts of our coast. Most persons accustomed to gather the sea-weeds know this, with its delicate, feathery, graceful branches. Sea-weeds, in general, show to greater advantage when waving in the water than when brought to land, and many lose their beautiful iridescent hues when removed from their native element. But it is the waving form of this, which bends with every ripple, which so much pleases us, and which we miss in the dried specimen. When young, it is of a pale delicate green, but as it becomes older it is of a deep olive tint. The fronds are sometimes one or two feet in length, without any vein up the middle, and not broader than a small leaf of the meadow grass. They are much branched; and when the plant is young, little bunches of green threads grow all down them, which, as the plant becomes older, fall off, and are succeeded by tiny sharp spines. If gathered while in a young state, it not only assumes a bright verdigris hue in drying, but it will impart that tint to the paper on which it is laid.

The strap-leaved Desmarestia (*Desmarestia ligulata*), is a larger sea-weed, with a flat frond, from each side of which issue branches situated

opposite to each other, and the branches have on their sides slender narrow leaves; it is olive-brown in the water, but becomes of a sea-green hue on

exposure to the air: and the species called the green or flourishing kind (*Desmarestia viridis*), has the same peculiarity. This is a beautiful delicate sea-weed, with slender, hair-like, bushy fronds, all proceeding from one base, which is not thicker than a goose-quill. At first, it is in substance

hard and rigid, but when exposed to the air, it droops and becomes soft, and in this state it closely adheres to paper.

Leaving unnoticed several genera of the Melanosperms, as being either too rare or too difficult of description without the aid of scientific terms, we proceed to a marine plant which on our rocky shores is common during the summer. This is the Dichotomous Dictyota (*Dictyota dichotoma*), which has flat fronds from about three to twelve inches long, irregularly cleft, and the segments narrower towards the extremities. It is of a clear olive-green colour, lighter in tint and thinner in texture than most of the olive-green sea-weeds.

Two frequent plants of our shores may easily be recognized by him who gathers up the stores thrown up by the seas. They are the two species of Sea Whiplash, sometimes called by our sailors sea catgut and sea laces. One kind of this whiplash (*Chorda filum*) grows attached to rocks and stones, and is of an olive-green colour, and cartilaginous substance. It waves about under the water like a number of strings, and has generally, at its tip, a bunch of thread-like sea-weed, which is parasitic upon it. This cord is hollow, and interrupted at intervals by transverse partitions, which are thought, by Stackhouse, to be designed to confine the air or elastic vapour within certain spaces, so as to act like air vessels and increase the buoyancy of the plant. The fronds extend to an amazing length, and always shoot upwards towards the surface of the waters. They are sometimes not more than a few feet long, and are spirally twisted. In its growing state, the whole plant is fringed with small delicate filaments, which render it very

slippery to the touch. This species is very common in the North Sea, where it is frequently found of the length of thirty or forty feet. Dr. Johnston finds it in the Bay of Holy Isle, about twenty feet in length. In Scalpa Bay, in Orkney, this sea-weed forms meadows, through which a pinnace with difficulty forces its way. And many an unwary swimmer has sunk, by means of this plant, to rise no more from the ocean bed. Often the calm quiet nook of water, whose sandy floors are covered with its long strings, seems to offer a delightful bathing-place; but the entangling cords form masses, from which the bather finds it difficult, sometimes impossible, to make his escape. In Shetland, it is known by the name of Lucky Minny's Lines: and the Highlanders dry it in the sun, and take off its skin, when it makes a good strong cord for the fishermen. It has also been much valued in the Orkneys for the produce of kelp.

The Jointed Whiplash (*Chorda lomentaria*) is nearly as common as this kind, and abundant on the coast of Devonshire, as well as on the western and eastern shores of Scotland. It much resembles the other species in general appearance, but is smaller. Dr. Greville remarks of it, that it is very similar to the intestine of an animal, tied at certain intervals. It is found in summer and autumn, and is of a thin flaccid substance, and of a transparent olive-green colour.

Another plant, which in the sea looks like fine strings, is the Whipcord Fucus (*Chordaria flagelliformis*); but it is not, like the whiplash, composed of one long cord-like frond, but has a central stem, with long branches, scarcely thicker than a

packthread, and equal in size throughout. It is very common in summer time on rocks and stones in the sea, and may be but a few inches long, though sometimes found of the length of three feet. It is a firm, dark olive sea-weed, and is solid in its centre. When seen under water, it appears to have a fine fringe of little colourless fibres, which render it very slippery to the fingers.

Very common in the sea, both in summer and winter, on rocks and stones, are the spongy branches of the sponge-like Cladostephus (*Cladostephus spongiosus*). It is not a very pretty sea-weed, for it has thick clumsy branches, of about the size of a cord, and about three or four inches high, densely crowded with little branchlets. It is a dirty brown or olive-green colour, and so spongy in its nature as to be unlike most other of our marine plants. A tuft of this weed is often very useful to the naturalist, as it retains a good quantity of sea-water, and therefore will long preserve any living creature which he may wish to convey home for examination. The whorled Cladostephus is equally common, and is a larger plant, much like this, but less spongy in texture.

With the description of one other of the olive-green sea-weeds, we must close this short account of them, leaving untold of many an interesting plant on which the imagination loves to linger. Some, whole families, parasitic on other plants, seeming scarcely more than tufts of brownish or greenish threads; some with flat fronds like the sea endive; and others, whose crowded fronds form a thick fringe on the leaves of large sea-weeds.

The most beautiful of all the Melanosperms must not be passed over in silence. It is not a sea-weed which is very general on our coasts, but any one who finds it, may at once recognise it by description. This singular production is the Peacock's Tail Pavonia (*Padina pavonia*), and is an autumnal plant. The old writers called it Turkey Feather; and it was once considered a sea fungus. Its frond is broadly fan-shaped, becoming narrow at the base, sometimes cleft at the edges, and marked with numerous concentric lines. The margin is fringed, and generally turned down or rolled backwards; and every one will admit that its appearance quite accords with its familiar name. This elegant sea-weed has been found in various parts of Devonshire, on the Scottish shores, and also on several parts of the coast of Kent and Sussex, particularly at Margate and Ramsgate, and it has been occasionally seen at Dovor. Its place of growth is usually in some of those clear rocky pools by the shore, where the water is still; and it may then be seen in tufts of two or three fronds together, waving if but a zephyr stirs the surface of the waters. It is about two or three inches high, of a pale yellowish olive-green, with concentric zones of a deeper tint, generally covered with a whitish powder on one or both sides, and its edges are

fringed with most delicate hairs. It has been observed of this lovely plant, that while it is growing it is not uncommon to see the rays of light decomposed as by a prism by this mass of minute filaments which fringe the margin. Dr. Harvey remarks of this sea-weed, that it is found pretty extensively in the seas of warm countries in both hemispheres, perhaps reaching its highest latitude on our shores.

The red sea-weeds (*Rhodosperms*) are more common in the seas of the temperate zone than in the colder regions or near the Equator, and among them are the kinds sought with most eagerness by the amateur collectors of sea-weeds on our coasts. They exhibit marine vegetation in its loveliest forms, and though not all strictly red, being often of purplish or brownish hue, yet they have among them the red colour in great beauty, sometimes in its palest or brightest rose tint, and in other cases of richest scarlet or crimson. Often they are like delicate fragile leaves, rent even by the touch of the finger, as we strive to unroll their plaits. Sometimes they are like little trees, with slender hair-like branches, all entangling each other as they hang dripping from the waters, but exhibiting the utmost regularity, and minute beauty of structure, when we dispose them on paper. The individual forms of several of our olive species, as the *Laminaria,* and especially the *Alaria,* are graceful and elegant; but when they prevail, as some of the commoner kinds often do, at the half-tide level, covering all the rocks and shores with a dark vegetation, they have a melancholy influence on the scenery; and when waves are rough, and clouds are dark, present a dreary waste. This

kind of sea-weed usually lessens as we approach towards the low-water mark; while, on the other hand, these are the plants which vegetate at greatest depth, and form submarine forests, into which the voyager, as he passes over the deep blue waters, looks down with wonder and delight. There he sees masses of sea-weeds whose trunks are as long as those of our highest trees, and whose leaves are like those of the Indian forests, and like them wave to and fro in grace and beauty, while their olive colour seems to deepen into blackness as the water becomes deeper. But many of the red sea-weeds need close examination to discover their beauty. No large masses cover our rocks or shores. Many are never seen at all by any but the marine botanist, who goes from the land and dredges them up from deep waters; and many need the aid of the microscope to detect one species from another. These sea-weeds seek the shade, and will not grow exposed to light and air; and where, as in some cases, they may occasionally do so, yet their less perfect and brilliant colour shows us that this is not their natural and most favourable condition. It is when far removed from light that they deepen into rich and glowing beauty, and strangely in this respect do they differ from the plants of our upper earth. We know well when the clinging ivy lends its greenness to the grey time-stained ruin, that should some branch creep through a crevice into the ruined darkness, it fades into a dull and sickly yellow or white. We know that our flowers lose all their beauty of colour when shut up where the sun's rays cannot reach them; but it is not so with sea-weeds. In the depths the olive becomes darker, the red and

purple are most perfect in hue; and Humboldt speaks of a beautiful marine plant which he found in the sea, near the Canary Isles, the Vine-leaved Fucus, which vegetates at the depth of one hundred and ninety-two feet, yet has leaves as green as those of the grass of the spring oak tree. On many of our shores the loveliest sea-weeds are never gathered, though everywhere some of the commonest kinds, as the Hair Flag, lie strewed about the sand or beach. And where there are rocky pools, we may gaze down upon some which redden in the shady nook formed by some little shelving eminence sufficient to protect them from the sun's brightest rays.

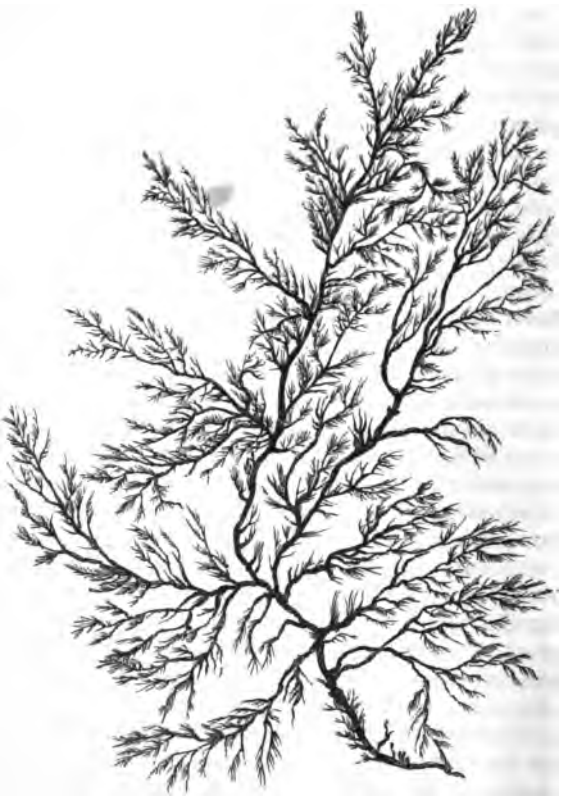
The division of the sea-weeds into the olive, red, and green series, is not an arbitrary, but a natural one, for, in a great measure, with similarity of colour is connected a similar structure. It is not, however, so invariable as to be a perfect distinction. Among the red sea-weeds we find every shade of purple tint, and of a few of the darker kinds we almost hesitate as to whether we should pronounce them to be red or olive-green; while exposure to air and light, in some cases, turns a red sea-weed into a dull yellow or a dirty white hue, or renders its crimson of a bright scarlet; and drying in the sun blackens almost all the olive-green species. Yet in practically studying sea-weeds, this presents little difficulty, for very generally we find the olive-green plants tough and leathery; the red usually frail and delicate, while the grass-green are always of simplest structure, and of tint little liable to change. In this almost constancy of colour the *Algæ* differ greatly from the plants of our upper earth, among which colour

is almost useless as a characteristic, giving us scarcely any idea of the nature or properties of the plant, and varying under circumstances of soil or culture. Thus we see the wild hyacinth trembling in the spring wood, and we call it the blue-bell; but we step into the next copsewood, and there we find our favourite woodland flower arrayed in purest white. The "brown or purple heath" sometimes greets us unexpectedly with snowy bells, and white blossoms sometimes surprise us on the root, where we expect to find the pink flowers of the Robert-leaved cranesbill.

The fructification of the *Algæ* is usually so minute, as to need the assistance of a microscope to detect it. Little wart-like excrescences, termed capsules, lie on the surface of the frond; or spots, called granules, are imbedded in its substance, or scattered on its surface. Some plants bear both these kinds of fruit, in which case the marine botanist terms the capsules the primary, and the granules the secondary fruit; though both capsules and granules contain seeds (sporules), which can produce a new plant. The grass-green sea-weeds are remarkable for having seeds which possess a singular power of locomotion, in some of the plants of the series appearing to be voluntary, so that naturalists have not yet decided as to whether they may not be endowed with animal motion.

The very commonest of all our red sea-weeds is the Hair Flag, or Landscape weed (*Plocamium coccineum*). So frequent, indeed, is this plant, that every one who visits the sea-side must have seen it, and it is seldom omitted in those drawings of marine weeds which accompany pictures of groups

of shells. It is common also in the Atlantic, Pacific, and even Indian Oceans. Its generic



name is derived from a Greek word, signifying hair, or a head of hair; but, as Dr. Greville has

observed, it is not a very happy appellation, for finely divided as is the frond, it cannot be said to resemble hair. The frond grows in tufts, varying from two to twelve inches in length, very branched and bushy, the main stem irregularly divided, and seldom thicker than a coarse thread. All the smaller branches are set with uniform little branchlets, like the teeth of a comb. There are three or four on one side, and then three or four on the other. These produce a second series of three or four tiny branchlets from their upper edge; and a third, or even fourth occur, each less than the preceding one, but of the same number, and always from the upper or inner edge. Though these are minute distinctions, yet they can be clearly seen without the aid of a microscope, and serve to mark this sea-weed from all others. It is often called the Scarlet Hair Flag, but it is rather between a crimson and a scarlet tint, and sometimes of a rose colour. Common as it is, it well deserves Dr. Greville's praise of it, as that writer says, it is "one of the most charming and symmetrical *Algæ* in the world."

Our beaches, after a stormy day, are strewed with specimens of this plant sometimes large enough to cover the palm of the hand, and now and then of sufficient size to spread over the surface of a half sheet of post paper. Some years since, the poor people who lived on various parts of our coasts, were accustomed to make for sale very pretty landscapes of sea-weed; and this was a very suitable plant for their purpose, as it retained its colour, and well represented a tree. This practice is less general now, but little groups of shells and sea-weeds are still occasionally offered

for sale, and this elegant plant is generally selected to ornament the picture. Dr. Johnson says, that fancy work with this sea-weed was once a favourite amusement with the princesses, the daughters of George III.

Scarcely less common than the hair flag is that very different looking sea-weed, the Dulse, or Palmated Rhodomenia (*Rhodomenia palmata*); and

this, which so often bestrews the sands and beaches of our British islands, is consumed in various ways, both in the countries at the North of Europe and in the Greek Archipelago, as well as on the Scottish and Irish coasts. Few of those who pick up the plant from our English shores to examine it, are aware how useful it is to others. In September and October, and indeed throughout the winter months, it may be found in abundance, growing either on the rocks or on larger sea-weeds.

Its fronds grow in tufts of several together; they are flat, of a purplish red colour, and the segments so divided as well to represent fingers, while at the base, a portion remains undivided, forming the frond altogether into the shape of the human hand. When the sea-weed is old, it is hard and tough externally, but within soft and mucilaginous. The young specimens are thin, and of a lighter colour, and they are frequently seen of the form represented by our engraving, consisting of a central oval piece, surrounded by palm-shaped leaflets, and situated on short slender stalks, and reminding us, when laid out on paper, of a sprawling insect with a small body and large limbs. As Sir J. E. Smith observes, this seems the most nutritious, and the most agreeable to the palate, of any species of sea-weed used in the northern hemisphere as food. Sir William Hooker remarks of it—"On the Scotch coast, it is eaten raw by the natives; and in the county of Caithness, in particular, I have seen a number of women and children gathering it from the rocks, and devouring it with great avidity." Both the Scotch and Irish also dry it in the sun, and roll it up and use it instead of tobacco. Nor is this dulse eaten only by the peasants. It is not indeed a general article of diet, as it once was, in any part of our kingdom, save on those remote shores to which, as yet, refinement has not brought new tastes and new dishes; yet many who can afford to procure costly food relish it still, perhaps because it brings with it some associations of childhood, as some of us may now like the blackberries or other wild fruits, because they remind us of by-gone times, and happy hours in the woodlands. Many, too,

eat this sea-weed before breakfast, because of its properties in cleansing the blood: and wisely do they thus adopt a plant containing the iodine, that powerful remedy in scorbutic affections. In Iceland, on the coasts of which island it is strewn in profusion, it is used largely as food for cattle, and also much eaten by the people; and indeed this and a few other sea-weeds were, in earlier times (particularly before the introduction of the potato), almost the only vegetable food which the Icelanders could procure. These marine plants were eaten either fresh or dried, and were certainly a nutritious food, though perhaps palatable only to those long used to them. The sea-weeds were at that time an article of their inland trade; but we must rejoice with them, that they have now not only the potato, but the different varieties of cabbage, even the cauliflower, and several kinds of turnip, growing in their gardens; and though not so luxuriant as in our more genial climate, yet they add to the few vegetable luxuries which the Icelanders can enjoy, and render the dulse a less necessary article of diet. The dulse in that island is generally cooked; or, if eaten uncooked, it is prepared for their meal by long drying in the sun. Previously to this, it is usually washed thoroughly from all remains of the sea-water; and during the process of drying, a fine white powder, of a sweetish taste, accumulates upon it. The plant is then packed in casks, and preserved to be eaten with fish and butter; or it is cooked by boiling it in milk, mixed with rye flour. The Kamschatdales boil this sea-weed, and procure from it a pleasant fermented drink.

This plant, which is the Dulse of the Scotch,

is the Dillesk of the Irish, and the Sol of the Icelander. The Norwegians term it Sou söll, or sheep's weed, for the sheep are so fond of it that they are said to be often lost by having strayed to the coast to feed on it at the ebbing of the tide, and having rambled too far from the shore, have been washed away by the returning waves. The Highlanders have a very poetical name for it, for their word *Duilliag* is a compound of *duillé*, a leaf, and *uisge*, water; literally "the leaf of the water." It is used medicinally in the isle of Skye, and Neill observes of it, "There is a common saying, in Stronsa, that he who eats of the dulse of Guiodin, and drinks of the wells of Kildingie, will escape all maladies except black death." The people of the Isles of the Archipelago boil it in ragouts, and consider that it not only renders these nutritious, but that it gives them an agreeable flavour. Like several other sea-weeds, it has, when dried, an odour of violets, and it is said to impart this sweet scent to water if placed in it. It is the celebrated *Saccharine fucus* of the Icelanders. It is abundant on our shores at low-water mark, and grows especially on the tangle stems. Several species of *Rhodomenia* are found on our coast, and one which is frequent on the English shores is termed the *Ciliated Rhodomenia*, because it is fringed with fine cilia or hairs all round the margin. It is usually more of a crimson tint than the dulse, but otherwise much like it.

The plant called the Pepper Dulse (*Laurencia pinnatifida*), is one of our most common sea-weeds, its crowded tufts growing on the sides of the rocks, and hanging to them very closely. Several fronds spring from the same base, varying in

length from one to fourteen inches, but a common specimen would about cover the hand. Sometimes they hang in crowded clusters in the manner called by botanists *imbricated,* that is, lying over

each other like the tiles of a house. The branchlets are all thickened and rounded at the end. It is a thicker and more juicy sea-weed while young than most of the red kinds, often iridescent, and very brittle. It is in colour of a yellowish or purplish red, being of so yellow a tint when growing in places exposed to the sun, that one unaccustomed to the marine plants, would probably place it with the olive series. There is also a variety which is quite green, and one which is yellow. This latter variety is common on the English coast, and grows in dense erect tufts in shallow pools much exposed to the light, while the plant in its usual form

prefers a shaded situation, nearer the ebb tide. This is the sea-weed which was sold in Edinburgh very generally with the dulse in former days. It is still carried about for sale in Inverness as the pepper dulse, and much relished in its raw state by the Highlanders. Lightfoot says that it was formerly eaten as salad. Dr. Johnston observes of this, that the custom is not likely to be revived, both the taste and odour of the plant being disagreeable; to the English generally they are remarkably so, though the pungency in the young plants is very slight.

But turning from a sea-weed which is less beautiful than useful, we must describe that most lovely of all our British marine plants, the Red Dock-leaved or Blood-coloured Fucus (*Delesseria sanguinea*), a plant which may easily be recognised by a familiar description. It is in its most beautiful state during the summer, and a very common marine weed on most of our shores after rough weather. It has a stem scarcely an inch long, dividing thence into two or three branches about the thickness of a crow-quill, which bear a number of clear shining pink leaves, each with a vein up the middle, and about five or six inches long; but in fine specimens ten inches in length. This plant is very lovely when waving its leaves about in the water, and if well dried it scarcely loses any of its beauty on paper. Like all the more delicate kinds of sea-weeds, it should be washed in fresh water, and then laid on paper, in a flat dish, in water about an inch deep. Care should be taken to dispose it in its natural form on the paper, with a needle or camel's-hair brush, and to remove any sand or other extraneous matter which may

adhere to it. The paper should then be taken gently from the dish, and held up that the water

may drain off. The sea-weed, on its paper, should next be laid between two or three folds of linen or blotting paper, and this plant, as well as the delicate red and green sea-weeds generally, will by its glutinous nature, adhere to the paper, though there are some which must be attached by means of gum. The coarse olive sea-weeds need only to be well washed in fresh water, and dried between pieces of cloth or blotting paper. If this *Delesseria* is well pressed, it will lie so closely on the paper that its elegant transparent wavy leaves resemble a most beautiful painting. Turner justly remarks of this species, that in the elegance of its appearance,

and the exquisite colour of its most delicately veined leaves, this fucus so much excels all its congeners, that it carries away the palm with no less justice from the vegetables of the ocean, than the rose, the flower of the poets, from its rivals in the garden.

Equally common, or more so than this, is the Red Oak-leaved Fucus (*Delesseria sinuosa*), which often clings like some frail red flag around the stems of the tangle. It is, like the last-named species, a tuft of transparent pink leaves, but its margin is more deeply indented, in some specimens so much so as to have great resemblance in shape to the leaf of our forest tree. It has, too, around its edges a number of small leaflets which sufficiently distinguish it. It has always a much broader leaf than the blood-coloured fucus, and is not nearly so brilliant in colour.

Very frequent on our coasts, also, is the Winged Delesseria (*Delesseria alata*), which has a broad frond cut deeply into segments and veined like a leaf. This species is transparent and rose-coloured or dark crimson; while the Proliferous Delesseria (*Delesseria Hypoglossum*), which is not uncommon on rocks and on the larger sea-weeds, resembles a mass of pale thin pink leaves, with smaller leaflets growing out of them. The frond or leaf is at first entire, several growing from the same base. It is a beautiful, clear, rose-coloured sea-weed, but though not rare is rather less frequent than either of the other species mentioned.

A very pretty common little marine plant, and one easy of description, is the opuntia-like Catenella (*Catenella opuntia*). Every one knows that

succulent plant called the prickly pear or opuntia, which swells out into oval leaflets, contracting at each end. This is just the shape of our only species of catenella, which is jointed so as to remind one of a string of beads. It is to be found on most of our rocky shores, growing in small creeping tufts, densely matted and entangled, scarcely an inch high, but the frond branched with erect branches. Its hue is not beautiful, as it is of a dull purple, almost approaching in some individuals to black, but it is somewhat transparent; it turns black in drying.

Another sea-weed which soon darkens when removed from its native waters, and becomes so black as to resemble a dried plant of the olive-coloured fuci, is that frequent plant the much branched Forked Furcellaria (*Furcellaria fastigiata*), which grows on rocks in the sea, and is scattered most profusely after a storm on the shore. It is of a pale pinkish purple, or purplish brown colour, rather rigid, and becoming quite crisp as it dries. It is well termed forked, as it branches off in a number of divisions, each like a two-pronged fork. During summer it is half covered with a sand-coloured crust, which is in fact a zoophyte, the crust being the home of many minute polypes.

Our tangle plants are often very interesting to the marine botanist, on account of the number of delicate sea-weeds which grow on them. Some grow only on their stems, and many which are sometimes attached to other algæ are often found especially crowding on this. This is the case with that pretty, delicate, rose-coloured plant, the Dotted

Nitophyllum (*Nitophyllum punctatum*), which is so called from the little seed spots scattered over its

transparent frond. This plant is exceedingly thin and clear, and when dried adheres well to the paper. It is not uncommon, though less frequent than the Lacerated Nitophyllum (*Nitophyllum laceratum*), which adheres so closely to the rocks by its waved edges, that its delicate thin fronds can scarcely ever be obtained in a perfect state. It clings also to the fingers, so that the botanist must manage it with skill, or he will tear it. The margin of this species is sometimes delicately fringed, and the plant is of a pinkish or brownish red. Every plant indeed of the genus Nitophyllum, is remarkably fragile, even among our red sea-weeds, and Dr. Greville named this group

from two Greek words, signifying a bright or shining leaf, as most of the species seem, when dried, as if varnished,

It is in summer and autumn that we find the greater number of our sea-weeds, but the Carrageen moss hangs about our rocks, or grows in handsome tufts on the tangle, very early in the

year; and there is no part of our shores where rocks are to be found on which it is uncommon. Often when a walk on the beach is scarcely possible because of the raging winds, and the

waves now dash forward, and then with deeper sound, are drawn back again over the stones, awakening an emotion almost akin to awe as we listen to their wild music; often will they at such times bring up the fresh tufts of this plant, consisting of many fronds like that described by our engraving, all growing from one root. This carrageen moss is a tough leathery sea-weed, generally of a purplish brown colour, often tinged with red, and having, when in fructification, roundish capsules imbedded in the frond, and forming on one side small hollows, and on the opposite surface corresponding prominences. The segments into which this frond is divided are often so twisted as to make the name of the sea-weed, the curled chondrus, very suitable, but it is commonly called Carrageen, or Irish moss, and is sold by the druggists under that name. Plentiful as this plant is on our shores, and nutritious as are its qualities, it is to be regretted that it is not more generally used by the poor as food. It is indeed often boiled into a jelly, and, made palatable by the addition of wine or lemon juice, is given to invalids and considered a good remedy for coughs and affections of the chest. But it is so gelatinous in its nature, that it serves admirably to thicken soup; and a small portion of meat, accompanied by a good quantity of the carrageen moss, well boiled, would furnish a wholesome meal to many a poor family, who, at the same expense, could procure only a much less nourishing diet. The confectioner does not disdain to use it to thicken his blanc-mange, as well as some other dishes. It is also sometimes converted into size for the use of

the house-painter, and Dawson Turner availed himself of its glutinous nature to form a glue by which he pasted on paper such sea-weeds as would not adhere to the papers on which he arranged them.

Dr. Greville calls this plant the Proteus of the marine algæ, for it varies so much according to its situation and the measure of light which reaches it, that the young botanist finds it almost impossible to determine to which of the described varieties an individual plant belongs. The width of the frond is so different; sometimes it is an inch across its widest part, sometimes not a twelfth part of that width. Then it divides itself into such various shapes; sometimes the segments at the edges being round, in others acute or jagged; or forming long slender points; and if this sea-weed grows in a spot where it is exposed to the influence of fresh water, it alters so much, that an ordinary observer of marine plants would think it belonged to a different genus. Then its colour is variable. When growing in a shady pool it is iridescent; when it has been lying in the sun it is bleached perfectly white, while it may be seen in all the intermediate tints between white and dark purple, often tinged too with green. Nor is it even constant in its place of growth; for on the very shore where in one spring it lies in great profusion, it is not unlikely that in the following year a few specimens only will be found.

Another common species, which is, equally with this, termed Carrageen Moss, and which exactly resembles it in its nature and properties, is the *Chondrus mamillosus*. This grows on rocks and

stones in the sea, and is finest during the winter months. It is generally of a lighter colour than the former plant, and the segments of the frond are not flat, but channelled. The most obvious distinction from the curled crispus, however, is its producing on the surface of the broader segments little capsules on short stalks, each about as large as a turnip seed, which contain a mass of red seeds. It is very variable in size and shape. It is of an East Indian species of this genus that the Chinese birds make those nests so much valued in the East, and which being sold at so high a price, are often procured at the hazard of life from some of the sea-caves.

In the winter time, too, there is a common

sea-weed on the English shore, called the Red Phyllophora (*Phyllophora rubens*), with a fine but

rather dull red tint, which is pale rose-coloured in the young shoots. Its frond is wedge-shaped, with a midrib or vein sometimes plainly marked; at others not visible. Towards the end of this frond arises one or more of the same shape, growing out of it as it were, and then from that proceed others, until the plant is sometimes five or six inches long. This is a very peculiar mode of growth; and the sea-weed can scarcely be mistaken if compared with this description.

There is a very lovely little sea-weed called the Feathery Ptilota (*Ptilota plumosa*), common on our shores in summer and autumn, and found more generally on the stem of the tangle than elsewhere. We shall only describe it as resembling a pink or dark purplish feather, having its branches all feathered with little rays or pinnæ, seated opposite to each other on the main stem, just like the red plume of a robin, only that it is more flexible. Dr. Greville remarks of this plant,—"The finest specimens I have ever seen were communicated to me from the Orkney Islands. One of these, now lying before me, is a foot in length, and completely covers a large folio sheet of paper; many of the long branches lying over each other." When left to dry on the shore, the plant turns of a violet-colour, then to brick-red, and lastly, changes to green.

That very abundant plant of our sea-side, the Scarlet Dasya (*Dasya coccinea*), will be sufficiently described by the engraving. Its stems vary from two to six inches in height, and are rough, with minute hair-like fibres, and generally of a deeper red than the branches. It is of a dull pink colour in the water, but on exposure to the sun becomes

of a rich scarlet-crimson. It is not common on the Scottish shores.

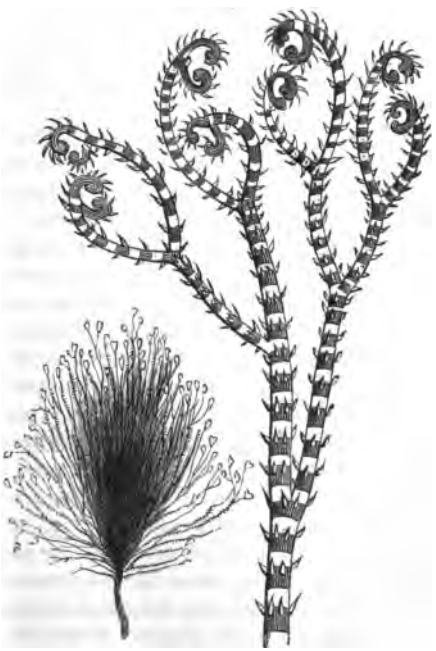
One of the more thick and substantial of our red sea-weeds, and one which is so constant in its general appearance as to be of easy recognition, is the Esculent Iridæa (*Iridæa edulis*), which, as its name imports, has often been used as a vegetable for the table. It is too tough to be a good food if eaten raw; and indeed when cooked, is inferior to the true dulse, though it is often called dulse in the south-west of England. It is there eaten by the fishermen; and after having been pinched with hot irons, it is said to have the flavour of roasted oysters. It is not one of the sea-weeds in which the Scottish peasantry take much delight, yet it

is sometimes roasted by them in the frying-pan and eaten. Dr. Greville thinks that its reputation as an article of food, has arisen from its having been very generally mistaken for the true dulse, the *Rhodomenia palmata*. It is indeed much like that plant in colour, being of a deep blood-red, which as it grows older, changes to green or dingy white. It often becomes much darker in drying. It is a fleshy thick leaf, without any veins, flat, and the upper part somewhat egg-shaped, but narrowing off into a slender stem at the base. It is seldom in a whole state when the waves dash it on the shore, but is often split to the very base into several pieces, for its succulence renders it less flexible than many sea-weeds, and less able to resist the force of the waves. It is a favourite food too of the crabs and other living creatures of the deep, so that its edges are often bitten, and large holes made in its frond by the depredations which they have committed; and when full of water it bends by its own weight.

This sea-weed grows on rocks in the sea, usually near low-water mark, and is one of our autumnal plants. It is frequent on our southern coasts, and also on the western coast of Scotland, but is less general than the true dulse. It is very pretty when young, as the fronds grow in tufts. When laid to macerate in water, it tinges the liquid with a fine purple tint; and an excellent lake colour has been procured from an infusion of the plant assisted by alum.

That firm, almost horny, sea-weed, the Horny Gelidium (*Gelidium corneum*), of a dark red or even blackish-purple colour, is common on most rocky coasts of Great Britain and Ireland, growing

on rocks in the sea, usually at the margin of those pools and hollows which are always filled with water by each returning tide. Equally common too is the Red Ceramium (*Ceramium rubrum*), with its pale pink fronds, with stems and branches about as thick as coarse threads. But we must pass it by as difficult of description, and proceed



to another frequent plant of the genus, which will be recognised by the accompanying illustration. This is the Ciliated Ceramium (*Ceramium cilia-*

tum), a plant common on our rocky shores, and often attached to corallines. It generally grows in tufts about two inches long, sometimes of bright red, but at others more purplish. It is stiff and rigid, and has a singular structure. Most persons know those common plants of our moist lands, the Equisetums or Horse-tails. The rigid branchlets of these weeds break off at intervals where they are jointed; and this sea-weed snaps in pieces just in the same way at the joints; and a circle of small clear spines surrounds each joint, rendering the plant very beautiful.

A genus of our marine plants has been named *Griffithsia*, by Professor Agardh, in honour of Mrs. Griffiths of Torquay, whose investigations on British sea-weeds have contributed very largely to all that is now known respecting them. The coralline-like Griffithsia (*Griffithsia corallina*), is much like a coralline in its form, as the joints in the main stem are swollen, so as to give them a beaded appearance. It is of a bright pink colour, darker at the joints, and it stains the paper red on which it is placed. This plant is common on the southern shores of England, but becomes more rare as we advance northward. It is not so general as the bristly species (*Griffithsia setacea*), which is a rigid hard sea-weed of a rich crimson, changing to a dull orange colour. If placed in fresh water, this plant loses all its firmness, becomes flaccid, and turns to a bright orange. This, however, is not the only change which it undergoes. When placed in fresh water for a few seconds, and then taken from it, it gives out a crackling or crepitating noise, which Dr. Drummond, who first discovered this peculiarity, de-

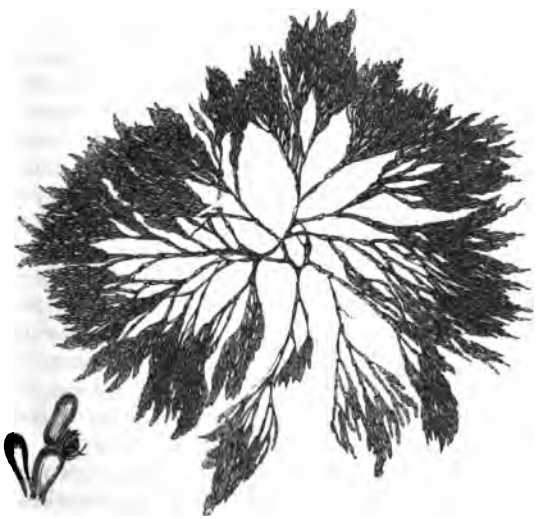
scribes as like the sound caused by throwing fine salt into the fire. Besides this, when in fructification, the plant projects minute globules of water, or some fluid, to the distance of several inches. This phenomenon may be seen several times in the same specimen, by alternately putting it into the liquid, and removing it; but as might be expected, the crackling noise is less audible the oftener the experiment is repeated. There are now known thirty species of the Griffithsia; one only belongs to tropical countries. Some very lovely kinds are found in the Mediterranean Sea and Australia, and several in the waters of the Cape of Good Hope and Western Africa. They are all, more or less, injured by being placed in fresh water, or even exposed to air; and when kept for a whole day in salt water, their colouring matter will be ejected with violence. Their favourite haunts are the perpendicular sides of pools, where they are well shaded by the long frond of the notched olive-green fucus, or the strap-shaped Himanthalia, which often wave above these and a number of other beautiful and delicate marine plants. One very interesting fact is noticed in one species, which grows on most of the rocky shores of the Atlantic, from high northern latitudes down to the tropical regions. When viewed beneath the microscope, its blackish purple tufts display strings of small pear-like substances, most beautifully and symmetrically disposed, each marked with a white cross, surrounded by a rich red colour. And so all nature has its hidden wonders—its beauties revealed alone to the earnest inquirer, as if to bid us search more deeply into the works of God, and to come with humility

even to the lowliest weed of the rock, to ask a lesson of his skill and care.

The cause of the peculiar startings in the bristly Griffithsia, are explained by Dr. Drummond. The joints of the sea-weed are full of a coloured fluid, and while in its natural condition, the partitions between the joints remain perfect; but no sooner does it come in contact with the fresh water, than these partitions burst, and the contents of one joint is exploded into the next; while at the same time the colouring matter loses its usual tint, and curdles into grains. From the force with which the fluids issue through the partitions in the joints, the sides also of some of them become rent, and then at every new starting a quantity of colouring matter rushes from these rents into the water. "The latter explosions," observes Dr. Drummond, "present under a common magnifier, an extremely interesting appearance. They are instantaneous; and when the projected fluid has attained its extreme distance, the colouring matter suddenly settles in a crowd of dark grains, so as to give not an unlively idea of a bomb-shell in the act of bursting. Sometimes several of these occur in rapid succession, and again half a minute or more intervenes between them." It is most interesting to watch this process, which may be observed, in any fine specimen of the plant, with the naked eye or with a common magnifying glass. Dr. Drummond observed a similar phenomenon in fresh specimens of the Dotted Nitophyllum.

Our engraving represents the coralline-like Griffithsia (*Griffithsia corallina*), a common sea-weed of a bright pink colour, the swollen joints of

which are of so peculiar an appearance, that it may be easily recognised. It much resembles the common corallines of our shore. We often find



this plant of a much paler colour, or sometimes tinted with green hue, by exposure to the sun.

Several of the large genus *Polysiphonia,* are among the commonest plants of the sea-side. One especially is known to every observer of marine productions, by its frequency as a parasitic weed, on the stems of the large knobbed fucus. This is the Fastigiate species (*Polysiphonia fastigiata*), which forms thick bushy tufts, of dark rigid hair-like filaments, of a purplish-brown tint. In drying, the plant becomes black, and gives this sea-weed

a remarkable appearance. In preserving specimens of the fucus, care should be taken to procure one on which this parasite exists, as it is almost peculiar to the knobbed fucus, and so frequent as to seem almost to belong to it.

There is very great beauty in some of these Polysiphoneæ, with their red or dark purple tufts of filaments. They were named "many siphoned," in reference to the numerous little canals by which the coloured matter is carried from one end to the other of the plant; and this colouring matter seems greatly affected by circumstances. When growing, these plants are brown, but when plunged in fresh water they become purple or pink. Several of the species are common, but all too much alike to admit of popular description. The Bushy Polysiphonia (*Polysiphonia fucoides*) is a frequent plant on rocks, and on other sea-weeds. It is from four to six inches long. The main stalk, which is about as thick as a coarse thread, is very rigid and dark at the lower part, and very bushy with numerous branches above. The superior branches are of a dull reddish-brown, and rather flaccid. Dr. Johnston observes of this species, that though subject to some variety, the practical botanist recognises it by the dark dull colour of its rigid stalk, its elongate flattened form, and by the bushiness of its superior branches.

Another plant of this genus, the Lobster-horn species (*Polysiphonia elongata*), is a firm, though slender sea-weed, with a main stem as thick as twine, and branches which somewhat resemble the horn of the shell-fish from whence it has its name. It is slightly marked with rings on its stem and branches. It is very common on rocks,

and so also are several other species. One of them, the dark Polysiphonia, sometimes covers

rocks by the sea-shore with dense patches, and varies in height from a few inches even to two or three feet.

A very common production of our shores, the strong-jointed Coralline (*Corallina officinalis*), is now placed, with the other species of the genus,

among the red series of sea-weeds. Our figure represents this plant, which is covered with a cretaceous substance, so as to look more like some of our zoophytes, as the sea-fans and other corals. It is only of late years that this production has been well understood to belong to the vegetable kingdom. Ellis ascertained, that like the corals it effervesced if vinegar was poured upon it; but the entire absence of polypes, or of any indication of animal life; and the fact of its yielding sporules, contained in receptacles like those of the red sea-weeds, mark its vegetable nature. We find it sometimes covering the base or sides of rocky pools with its pale lilac, or pink, or ash-coloured sprays; or its tufts are blown about by the winds on the shore till they lodge themselves in some nook, and then bleach to an ivory whiteness. If the plant is immersed in fresh water, it immediately becomes of a pink or bright orange-colour. There are several other species of the jointed corallines on our shores, but they are at present imperfectly defined, and the one here named is the most general.

Many of our rocks are quite green with some of the Confervæ tribe, which grow on them in such profusion as to render them so slippery that we

fear to set our foot on their surface. Everywhere we find stones by the sea, as well as the stems of other algæ, clothed with the long filaments of the green rock conferva, sometimes called the Arctic Conferva (*Conferva rupestris*), and with the paler green species (*Conferva lætevirens*), with bushy

tufts of a fine yellowish green colour, which, as they dry, become of a grey green, and are without any gloss. During a greater part of the year these plants are found in great abundance. The writer once heard a friend playfully describe some stones which were covered with them, as the "green-haired rocks," and their fibres might well be compared to tufts of hair, for multitude. When we gather a tuft, these fibres all hang drooping together, but a very small portion is sufficient for a dried specimen; as, when carefully preserved, the slender threads of a small tuft may be easily laid out so as to cover a large piece of paper like a

miniature green tree. They will not, however, usually adhere to paper without the aid of gum.

These plants belong to the group of grass-green sea-weeds, the chlorosperms of the marine botanist. They are found on the shore near high-water mark, and in the shallow pools into which the rising tide daily pours its liquid nutriment. They are the sea-weeds which have the simplest structure, and are the least varied in species on various shores; and they form the chief marine vegetation of the polar seas. Some of the green sea-weeds are known to all who have observed the marine plants on our rocky shores.

The Ulvæ, or Lavers, are flat green leaves, very transparent, and easily torn, and when laid on paper are scarcely thicker than gold-beater's skin. The broad green Laver (*Ulva latissima*), is of a bright, herbaceous tint, becoming tinged with brown as it decays. It has a broad, ovate, plaited, glossy leaf, and as it waves up and down in the water is extremely elegant. It is sometimes called green sloke, green laver, or oyster green. Gerarde tells us whence it received its latter name; he says: "It is very well known even to the poore oister women, who carry oisters to sell up and down, who are greatly desirous of the said mosse for the decking and beautifying of their oisters to make them sell the better." These leaves keep their green tint so well, that they would indeed be highly ornamental to a fish-basket, only that their thin texture prevents their retaining the leaflike form.

This laver is often brought to table as a stewed sea-weed. Sir J. E. Smith remarks of it, that within a few years past it has been "introduced

to fashionable tables, being stewed and seasoned with lemon-juice, which lessens its saltish flavour and sea-weed scent; nor is this dish unpleasant, after a short trial, to most palates. We suspect it to have been originally contrived with a medical intention, for the benefit of scrofulous patients: how numerous, alas! in the gay circles of the opulent and great." This plant is not, however, the true laver.

Tender and delicate as is the frond of the broad green laver, the species termed the Lettuce Laver (*Ulva lactuca*) is still more so. This is a smaller plant, and a less common one, though found on rocks, stones, and corallines, during May and June, on many parts of our coast. It is rarely six inches long, while the former species varies from that length even to eighteen inches. It is also lacerated, more or less, and at length irregularly cleft down to the base, and the jagged and cut appearance which it presents, somewhat similar to endive, originated its name of lettuce laver, though the broad green laver is really more like a lettuce leaf. None of the Ulvæ are more beautiful when displayed on paper than this species.

The species called ribbon-green Laver (*Ulva Linza*) has a long narrow frond like a slender leaf, about an inch, or an inch and a half in width, which is beautifully curled and waved. It becomes paler as it grows older, unless growing on a spot well shaded from sunshine; but the dried specimen long retains its grass-like tint.

Of the same clear green colour as the Ulvæ, are the Enteromorphæ, some of which, with their long slender grass-green leaves, wave about like so many shreds of bright ribbons, filling the clear

pools, or hanging, with thousands of fronds, over the smooth rocks. One very common kind is the compressed Enteromorpha (*Enteromorpha compressa*), and it abounds on the shores of almost every land from the Arctic to the Antarctic Ocean. Useless as it is to us, except as its beauty may give us pleasant thoughts as we pause to look upon it, yet it is a valuable article of food to the poor natives of the Sandwich Isles, whose rugged rocks it covers with a verdant vegetation. Its fronds are from six to twelve inches long, from the fineness of a hair, to half an inch in width. At first, the fronds seem but threads, but as it grows in deeper water they grow long and broad, and when the plant is fully grown, the frond is divided nearly to the root into many long branches, which produce others, all narrow at the base, and widened at the extremities. They are tubular, though more or less compressed.

The intestine-like Enteromorpha (*Enteromorpha intestinalis*) is equally common, not only on our sea-shores, but in brackish and fresh-water ditches, and in summer time its fronds are often two feet or more long, and sometimes two or three inches in diameter. It is tubular also, and inflated, and often waved and wrinkled, and is of thin texture and pale yellow-green colour, fading at last to white, though when very young its tint is bright as the meadow-

grass. This species is not branched, and may, by this circumstance, be distinguished from the compressed kind.

These are some of the beautiful grassy weeds, which render a walk by the sea at low tide so interesting to all who observe Nature, not alone in its vast magnificence of sea and sky, but in minute details, its rocky fringes of sea-plants, or its delicate glass-like shells, handfuls of which come up when we put our hands into the salt-water pools. On a calm summer evening it is delightful to linger among the smooth boulders, or rugged rocks, looking now at the minute beauties of the water, and then at their wide expanse, bounded by the rich horizon of a glowing sunset. Calder Campbell has well described such a scene :—

"The tide is out, and every wave that breaks
Bids a brief farewell to the shelving shore;
Leaving pink weeds, white shells, and dripping ooze,
In token that it shall return again!

Rocks, rough with limpets and brown tangle weeds,
Jut here and there :—whilst on the steady cliff,
(Half hid in water, and half robed in weeds,)
Its cable sure the crafty mussel spins,
Lashing itself for safety to the rock.

White are the sands before me; here and there
Speckled with slaky spots of green, that tell
Where 'neath their emerald fringes cockles hide:
Strange shells, the marvels of old Ocean's bed,
Are strew'd around:—Have they been always here,
Or come they hither from far distant shores,
Unwilling captives of careering waves?"

But, beautiful as the green lavers, and resembling them in form and structure, is that lovely plaited reddish purple-coloured leaf, the Porphyra, or true laver (*Porphyra laciniata*). A fragile thing

it seems, as it waves hither and thither in the waters, or when we gather it thence, as it clings around our fingers as if their smallest movement would rend it. Nor is it less beautiful when carefully preserved on paper; it often becomes of the most delicate amethyst tint, rivalling the pride of the marine botanist, the red Delesseria, in richness of hue. Any one may recognise this plant by a familiar description; and from spring to autumn it is a common sea-weed of most of our rocky shores. Its thin leaves grow together in numbers; they are from three to eight inches long, very narrow just at the base, but widening immediately, and deeply and irregularly cut and waved, besides being very often torn into holes by coming in contact with some rough object, or by being eaten by shell-fish. The smooth glossy plants of this genus received their name from the Greek term for a purple colour, and all the species are, more or less, of this tint when in a perfect state, though when old they become tinged with green, and when very young they are sometimes of an olive hue, but still of the same transparent substance.

A very useful plant is this purple laver, good enough in flavour to be esteemed by the epicure a delicious dish, and valued often by the poor as a vegetable delicacy. It is more eaten in Scotland than in England, and on the coasts of the Western Islands, where it is abundant, large quantities are gathered for food. The Highlanders call it sloke kale, and also by the appropriate name of purple-green. They pound it and stew it in water into a kind of marine sauce; it is afterwards made into a dish with pepper, or with vine-

gar and butter, or it is eaten stewed with onions. In England it is usually pickled with salt in jars, and when prepared for the table is stewed, and oil and lemon-juice added to it. Sometimes this pretty sea-weed is washed up by the waves clinging round the stems of other algæ; and at other times it hangs about the piles of wood which support our piers.

The Common Porphyra (*Porphyra vulgaris*) is not so general a sea-weed on all the shores of our sea-girt isle, but is very abundant on Scottish coasts. It is a large plant, its fronds being commonly one or two feet in length, and two or three inches wide; and Dr. Greville mentions having seen one plant which measured no less than three feet and a half. The margin is much less waved than in the former kind, so that the frond seems almost flat, and the colour is more brilliant, being, when dried, of a rich purple. It is very thin, but not nearly so easily torn as the purple laver. A very slender species of this genus, too, covers some few rocks on our shores. This is the narrow Porphyra (*Porphyra linearis*), which, though not a quarter of an inch wide, and usually but three or four inches long, is of a beautiful tint. Dr. Greville remarks of it, that it is a singularly neat little plant, invariably constant in its form, and adds, that covering the rocks beneath Peakhead, near Sidmouth, in great abundance, it rendered them purple by its delicate fronds.

The Ulvæ, as well as the different species of Enteromorpha, and of Porphyra, are found on the shores of every land save those bound up in the regions of perpetual ice and snow. They give their green fringes to the rocky shores of the

Arctic Seas, and make many a little emerald island in the midst of the waters of tropical climes. One singular species of laver (*Ulva thermalis*), flourishes in the hot-springs of Gastein, where the water is at the temperature of 117° of Fahrenheit; while the thin gelatinous leaf of the Crisp Ulva (*Ulva crispa*), growing in our land on moist ground, and covering the old thatched roof of the cottage with its wrinkled frond, was the last land plant gathered during the Antarctic Expedition, at Cockburn Island, 64° south lat., beyond which the land seems destitute of even the slightest vegetation.

There are large genera of the Chlorosperms which must be left unnoticed here; and although several contain common sea-weeds, yet they are not so likely to be observed by the rambler on the shores who may not have studied marine plants, nor are they easily described in familiar language. One beautiful and elegant green sea-weed, however, the ornament of our rocky pools, must not be omitted. That graceful little plant, so like a bunch of soft green feathers, is the feathery Bryopsis (*Briopsis plumosa*); nor is it an unfrequent ornament of our sea-rocks and stones. It is usually two or three inches in length, with a thread-like stem, and generally without branches at the lower part. The branches then spread off, and are set with one or two series of the little feathers. The young plants, especially, resemble them. The plant is of a bright green, very tender and delicate, and when laid out on paper, to which it adheres very closely, it looks as if it had been covered with varnish, and the stalks become clear and colourless in drying. Its root consists of a

few threads, and its whole appearance well accords with the generic name, which is derived from two

Greek words, expressive of the resemblance of the plants to some species of feather moss. Dr. Greville names a beautiful exotic species, the *Bryopsis rosea,* which he says is the loveliest plant of the genus, and which is twelve inches long, and was compared by Bory de St. Vincent to an Italian poplar in minature. It is a native of the Falkland Islands.

CHAPTER III.

SHELLS AND MOLLUSCOUS ANIMALS.

"Even as the rainbow-tinted shell which lies
Miles deep at bottom of the sea, hath all
Colours of skies, and flowers, and gems, and plumes."

It is an interesting question, and one which yet is not fully answered, how far living creatures can exist below the surface of the deep. The wondrous architects of the coral reef cease to live at 100 feet below that surface, and so vast a number of shell-fish and crustaceous animals, of corallines and other zoophytes, dwell within a few yards of it, that the statement seems probable, that below the depth of a few hundred feet life ceases in the ocean, from the want of air and light, and from the pressure of the waters.

Yet the words of the poet are true enough. Miles deep at bottom of the sea, must lie the structures of myriads of once living animals; and shells of graceful form and glowing colours add to the constantly accumulating substance at the base of the ocean. Many are strewed upon our sandy shores, and so beautiful are they, that we wish, in our summer rambles, that the waves would bring them up to us in greater numbers, or that we could look down on a clear day into those recesses where

"Buoyant shells,
On stormless voyages, in fleets and single,
Wherry their tiny mariners."

We gather up those which we find, and looking at their structure would fain know something of the inmate of such a dwelling. All nature proclaims the goodness of God. We hear that the bird which wings its way over our heads has a song of joy; the bee hums delightedly by us; and the little shrimp which darts in the clear pool, seems full of merriment. Was the inmate of the shell less cared for by its Maker? No doubt the little builder had some sense of joy, as he framed from his own substance the house which excites our admiration. Doubtless his existence, short and sluggish as it was, had its own consciousness of pleasure; and obscure as is his history, and little calculated as such a creature might seem to perform an important part in the economy of creation, yet we know that he had a work to do, not only for the living creatures of the sea, but for the well-being of man himself.

Those living mollusks which glide along in such multitudes in the waters, are among the appointed messengers of death to the smaller animals, whose numbers would else exceed their destined limits; they, like other inhabitants of sea and earth, are the equalisers of life and death. In their turn they serve as food for the rich man, and are often the only meal of the peasant, or of the savage. The land bird stays his song, as he descends to pick up the limpit from the rock; and the sea bird, white as the foam over which he skims, dips among the shell fish for his food; while to fishes they furnish the daily meal. Thus much is evident to any observing person; but science has revealed to us other important uses of shells. Those shells are made of carbonate of lime, which, by some

mysterious process, the mollusk derived from the materials forming his food: materials which in themselves possess scarcely any portion of this substance, and yet which, when mingled with animal matter, serve to compose the calcareous habitation: and those towering chalk cliffs on which the short grass is now growing, or that long stratum of limestone, extending for miles away, is formed almost entirely of shells mingled with the skeletons of zoophytes and sea urchins, and other marine animals. The block of marble, hard as it seems, reveals, by the aid of a microscope, masses of shells, some of them perfect and unbroken, and rivalling in symmetry the loveliest shell in the cabinet of the collectors: while the myriads of shells lying in crushed heaps among the mountains, are hourly undergoing those processes by which they shall, after the lapse of ages, form the component parts of the gem to deck the coronal of princes, or the marble statue to be reared to the memory of worth or genius. Fossil shells were elegantly termed by Bergman the "Medals of Creation." The geologist reads in the masses of species of shells now extinct, histories of by-gone times and of earth's changes; and distinctly deciphers traces of revolutions, of which, but for their aid, we should know nothing. Fossil shells are among the most valuable records of the earth on which we live.

Though the study of the shells of land or sea is important to science, yet Conchology is much less popular than most of the other departments of Natural History. It may be that it is owing to the costliness of the pursuit. Foreign shells are expensive, and even a good collection of native

shells is not to be procured without considerable trouble, as there are many parts of the coast on which few marine shells can be gathered. They are not like the wild-flowers, which grace every way-side; or the song-birds of the woodlands; or the insects of our summer pools; and comparatively few are among the common things of earth. But perhaps the study of conchology has been in former times rendered uninteresting by the neglect of the animal inhabiting the shell. The collector had long prided himself on the beauty of the rare shells brought from distant seas, or on some well arranged cabinet of native species. He could descant on their rarity and beauty of form and tell their names and classification; but he had nothing to relate of the animal within. Until the labours of recent naturalists, scarcely anything was known respecting the structure or habits of the shell-fish; and even yet, the details which can be given of them are very few, not only from the difficulty of making observations, but from their having less activity and fewer modes of life than most living creatures with which we are familiar. Nor are they so easy of description as are most other natural objects; and the terms of science, often unpleasing and perplexing to all but the student, are almost necessary here, if we would convey a good idea in writing, either of the animal or its dwelling-place. And yet those who do examine the contents of the shell find matter of deep interest, and now that many are engaged in this pursuit, and monographs with beautifully coloured plates are publishing on different tribes of the molluscous animals, we shall gradually learn more of their nature and history.

Most of the common shell-fish are of a greyish or brownish white, or of a straw colour, sometimes clouded with dark spots. Yet some of them exhibit great beauty of tint, in which every shade of red, and orange, and yellow, and blue, may be seen. A writer in Loudon's Magazine of Natural History says of our native Cowry (*Cypræa europæa*), that it is a most beautiful creature, viewed from beneath, with colours unrivalled among the order to which it belongs. "The proboscis is dark vermilion; the tentacles yellowish red, spotted with yellow; the upper part of the foot streaked longitudinally with yellow and brown, and the mantle greenish brown, edged with brownish red; but notwithstanding, the shell is of a dull uniform white."

This writer tells us too of other shell-fish, which have fins or lateral expansions elegantly speckled with bright yellow, and the fleshy parts of the body marked with pink colour: while another is dotted over with milk-white spots, and others are mottled with black and white. Then the part called the foot of the mollusk is in some tropical species of blackish red; in some, green; in others black; in some deep red, with faint designs resembling those of the shell; and in others it is bright yellow and deep brown. The inmate of the beautifully marbled harp shell, he says, "glories in a rich vermilion-red skin." This writer also quotes a passage from a paper of Broderip in the Zoological Journal. "In the Mauritius," writes this gentleman, "it is the amusement of the place to watch over the trim apparatus of lines, hung over some sand-bank to tempt the various species of Oliva which there abound, or to wait for the more rare approach of the harp shell, till the

rich hues of its inhabitant are seen glowing through the clear blue water in the rays of a tropical rising sun." Nor is the colour of these animals all that is remarkable. They have a beautiful and wonderful mechanism, offering continually objects of interest, from the delicate net-work, or gills rayed like flowers, which in some species serve the purpose of lungs, and the strong fleshy foot by which the cockle leaps up, to the tongue of the limpet, which is two or three inches long, and armed with hooked teeth, that serve as a rasp in fitting its food for nutriment.

The large class of Mollusca comprises not only those animals which live in shells, but a great number of similarly constituted animals, which are destitute of this external covering. Their name, given by Cuvier, and derived from the Latin word *mollis*, soft, expresses the nature of their substance, and the oyster and snail are familiar examples of these soft fleshy creatures. Differing greatly in different tribes, yet they have some marked resemblances common to all. They have no internal skeleton, are all of a fleshy consistence, have no legs; and though their fins are often spoken of, yet these are mere expansions of a portion of their skin, and not separate appendages, though by their means the mollusks glide through the waters. The greater number among them have shells, either consisting of one piece or valve, like the periwinkle; or of two valves, like the oyster; or of more valves, as in the barnacle. When composed of two valves, the shell opens by means of a strong elastic hinge, and is closed, at the will of the animal, by means of muscles which pass from one valve to another. They usually

present a development of skin, which, covering the body more or less, like a mantle, has received that name from naturalists. This mantle in the greater number secretes those beautiful shells, whose variety of form and tint is so pleasing to us; while in other groups we have only the naked animal.

A large number of the mollusca seem destined to remain near the spot on which they first entered into life, and clinging to the rocks, are fed by the draughts of sea-water which convey to them thousands of minute animals. There are, however, among the bivalved groups, many which have an instrument of movement admirably adapted to their uses. Naturalists call this part a foot, and in the cockle and some others, this fleshy lump is shaped something like a human leg and foot; but in most it is an unsymmetrical mass of flesh. Its muscular structure is, however, very powerful, for it consists of a number of fibres, so interwoven as to confer the power of movement in every direction. Thus some bivalved mollusks half open their shells, and raising themselves upon them, urge themselves along in successive movements, by means of this foot, leaving a long tract in the sand or mud which they have passed over. Some, like the cockle, are enabled by this foot to leap to a great height; while others, again, will by its means delve deep down into the sands. Some, as the scallop, swim along in the water with most wonderful quickness, opening and flapping the valves together as they go; while on the shore they can move onwards or backwards, by using the valves of their shell in a similar manner.

The mouths of the shell-fish are formed accord-

ing to their conditions; thus, those which live on sea-weeds have horny jaws, or minute teeth; and those which, like the whelk, feed on flesh, have generally a long pliable tube, armed with teeth, by which they pierce the shells of their neighbours, and draw out their juices; while such as are destined to be fed only by the minute living things of the water, are destitute of these organs, and have mouths formed only of a little aperture.

Shells are of two kinds, porcelanous and membranous. Some are, like the cowries, which are brought from far distant seas to ornament our rooms, of a compact texture, resembling porcelain, and the surface is beautifully enamelled and variously tinted. The membranous shells, like that of the oyster, are formed of layers, composed of mother-of-pearl, and are often covered with a strong epidermis, or skin. All shells consist of carbonate of lime, mingled with animal gelatine, but the porcelanous kinds contain a far less proportion of animal matter than exists in the membranous shells. If the carbónate of lime contained in the last-named shells be subjected to acid, it will dissolve, and leave nothing but the thin membrane from which they take their name; while the more brittle porcelanous shell has its substances more equally blended in a crystalline arrangement.

Beginning at the lowest orders of molluscous animals, and gradually rising to the highest, we must select some of the common objects on our shores belonging to the class *Cirrhopoda* of the naturalist, the barnacles, which every sailor knows by their familiar name, and upon which most of us have often looked. The commonest

kinds are the acorn-shells, or *Balani*, which we see on all parts of the sea-shore, or on the shores of salt rivers, looking like shelly cones with the tops cut off, crowding over the shells of mussels, whelks, oysters, or on pieces of wood, and more or less imbedded in the substance to which they attach themselves. These cones are formed of hard shelly pieces, most neatly and compactly fitted together, and becoming larger as the animal grows older and adds to their size by periodical additions. A thin plate connects the cone with the substance to which it adheres, and at the summit is a small lid, which the animal can open or close as it pleases, when it needs to put out its arms in search of prey, or to withdraw them within the shell. Rocks near the sea are sometimes covered with these sea-acorns, and on pieces of wood drifted on shore they are clustered by thousands. The edges of the shells are very sharp, as those know well who have ever bathed in the floating-baths lying in salt rivers, when it is necessary sometimes to go into the water with shoes and stockings, to escape the wounds on the feet which are inflicted by them. So quickly do they encrust the wood-work of these places, that it needs great care and diligence in those who attend to them to keep the sides and floor of the bath clear of them. The *balani* are called sessile barnacles, to distinguish them from the stalked barnacles, and there are several species of the genus. Some kinds even lodge in the coats of the whale, deeply imbedding themselves in the defenceless fish; and others fix themselves on corals or sponges. We often see very large foreign shells of the sea-acorn in museums, and these have been the homes of animals

large enough to serve as food for man. The ancients regarded them as forming a dish for an epicure; and in the present day one species is cooked and eaten by the Chinese, and said to resemble the lobster in flavour.

Sometimes when wandering along the shore, or stooping among the rocks to pick up the treasures which the naturalist finds hidden there, we alight upon some stray piece of drift-wood. It may be but a part of a tree borne down long ago by a river to the spot, or it may be a piece of wood stranded from some wreck, awakening thoughts of pity as we look upon it, reminding us of

> "Shipwrecks and their spoils,
> The wealth of merchants, the artillery
> Of war, the chains of captives, and the gems
> That glow'd upon the brow of beauty; crowns
> Of monarchs, swords of heroes, anchors lost
> That never had let go their hold in storms;
> Helms sunk in ports, that steer'd adventurous barks
> Round the wide world."

But our piece of drift-wood acquires another source of interest if it be covered, as it sometimes is, with the stalked, or duck barnacle (*Pentelasmis anatifera*). Sometimes thousands of these creatures are crowded on a piece of wood but a few feet long, all twisting about, and presenting a moving mass of life, almost disgusting to any but the accustomed eye of the naturalist, who knows that among this mass he may find curious shells, coral-lines, and other objects which are not scattered on the shore. The growth of these animals must be very rapid, as the keel of a ship which has made but a short voyage will be sometimes entirely covered with them; and in some cases they are so numerous as even to impede the course of a vessel.

When ships thus covered arrive in our ports, the barnacles are eagerly scraped off by men who take them for sale as marine curiosities, or who make their delicate white porcelain-like shells into some

kinds of fancy shell-work. The barnacles themselves are eaten on some of the coasts of Africa, where they are very abundant. The shell of this animal is at the end of a fleshy stalk, generally of a purplish red, sometimes of a bright orange colour, and is of the form called multivalve, being composed of five pieces of valves, two of them on each side of the animal, and a narrow piece down the

back. It is a pretty shell, clear and brittle, of a white colour, tinged with pale blue. The food of the barnacle consists of small crustaceous or molluscous animals; and at times, when it is actively engaged in catching its prey, we may see protruding from its shell, its six pairs of arms, many-jointed and delicately fringed. They are most vigorous animals, and of so sensitive a touch that they can lay hold of the minutest object, and, entangling it in their feather-like arms, they can draw it to the mouth, seize, and devour it.

Very curious transformations occur in the condition of the barnacle tribe during their brief lives. Seeing them as we do, fastened to the timber or the rock, or encrusting the oyster-shell, shut up in their little dwellings, and without any eyes, one would not imagine that they were, at an earlier stage of their existence, endowed with active faculties. When first emerging from the egg these animals have a large pair of limbs, provided with hooks, which they are not slow to use when they choose to fasten themselves to any objects; then they have six pairs of swimming limbs and a jointed tail, the limbs acting like oars, and the tail also serving them as a means of motion, so that they are among the most active creatures of the sea. Their bodies, too, are at this period of their history covered with a shell of the nature of that of the crab, and they have large eyes set on stalks. In the course of time the limbs become changed into the fringed arms, and the shelly crust becomes a regularly valved shell; the stalk in some of the species developes itself, or the cone arises from the wood, or shell, or rocky base. The whole animal is so different when

> So rotten planks of broken ships do change
> To barnacles. O transformation strange !
> 'Twas first a green tree, then a broken hull,
> Lately a mushroom, now a flying gull."

Gerarde's picture is very amusing, as the young geese are represented as having their heads out of the shells, which are hanging on the branches, and seem as if calling to their companions gliding beneath them. Our great naturalist, Ray, however, whose work was published in 1678, opposed the popular notion, and a writer has ridiculed it a century earlier.

But leaving the barnacle tribe, we turn to some equally common molluscous animals which have no shells, but have a cartilaginous, flexible tunic, or outer coat. They are on this account called tunicated mollusks. Often in our rambles along the shore we pick up one of those strange looking things, commonly called sea-squirts (*Ascidiæ*), which have been thrown up from the sea by storms, or which sometimes seem growing on the stones, or large dark sea-weeds which lie among the rocks. If we press them ever so gently, we are immediately saluted by a jet of water. These animals consist of a shapeless sort of bag, sometimes of a pale brown colour, though often marked with beautiful and bright tints, and they have so little the appearance of animals, that we should at first hardly recognise them as living things, were it not for their habit of ejecting the liquid. This water issues from two openings in the rough skin. They feed on the contents of the water, which are brought to the mouth by the current. As yet the habits of these Ascidiæ are little understood; but it has been ascertained, that while in an earlier stage of

life, the animal is not the helpless creature which we find hanging to the sea-weed. When young it somewhat resembles the tadpole of the frog, though it is extremely minute, and it swims actively in the water, by quickly moving its tail. When inclined to fix itself to the rocks, a few fibres spring from it, which form a holdfast, and it then gradually changes into the condition in which it meets our eye on the beach. Some of these Ascidians are valued in China as articles of food, and are probably relished by a people who seem to have a singular taste in articles of diet, though their appearance is not such as would recommend them as fit for the table. In their internal structure, they much resemble the mollusks which form bivalve shells, the flexible tunic, or case, being analogous to the shell.

There is one group of Ascidiæ, which, unlike the sea-squirts, are not single individuals, but consist of a number of aggregated beings, forming one living mass, in some measure resembling the zoophytes, though they do not secrete either a stony or horny framework. Some of the commoner kinds may be found on our shores in plenty; and many of the tribe Botryllidæ form a jelly-like crust on some of our olive-green sea-weeds, or other marine substances, almost covering the stems of the marine plant, and presenting a beautiful array of starry objects, of the most delicate blue tints, or rich in every variety of red or purple, or of all the bright hues of the glowing sunset. These star-like objects on the surface of the jelly, contain about ten or twelve individual creatures, whose structure is found to resemble that of the sea-squirt, and the jelly-like substance is common

to them all. Our figure represents the starry botryllus (*Botryllus stellaris*), of its natural size, and a magnified single group. Other families of the

Ascidiæ move through the waters, linked in chains, giving out their lights in the darkness; and to this tribe belongs the wondrous Pyrosoma, whose greenish phosphorescent light gleams at night from its living shoals, upwards of a mile in breadth, and as the vessel dashes among them, illumines the sea with gleams of light.

Interesting and wonderful as are some of the shell-less mollusks, yet the forms which are found in greatest number and variety are enclosed in their beautiful ornamental coverings. The bivalve mollusca compose the class termed Conchifera. Our shores are strewed with multitudes of the common kinds; our limestone rocks and chalky cliffs are full of the double valves of animals of past ages. The dredge brings up many of those, which we know must be lying in countless myriads in the deep sea. Gaze into the rocky pools among the crags, and we see them among the thousands of living creatures revelling there; and, perhaps, no spot exhibits in so small a space so many individual and varied forms of life. The large sea-weeds have, tangling about their fibres, or

among their matted fronds, masses of shell-fish; and the remarks which Darwin has made on that wonderful sea-weed, the Everlasting bladder-chain, is, in a lesser degree, applicable to others. He observes, that a great volume might be written, describing the inhabitants of a bed of this marine plant. "Almost all the leaves, excepting those that float upon the surface, are so thickly incrusted with corrallines as to be of a white colour. We find exquisitely delicate structures, some inhabited by simple hydra-like polypi, others by more organized kinds, and beautiful compound Ascidiæ. On the leaves also, various patelliform shells, Trochi, uncovered mollusks, and some bivalves, are attached. Innumerable crustacea frequent every part of the plant. On shaking the great entangled roots, a pile of small fish, shells, cuttle fish, crabs of all orders, sea-eggs, beautiful Holuthuriæ, Planariæ, and crawling nereidous animals of a multitude of forms, fall out together." Life may not be so abundant among our masses of sea-weeds, yet those only accustomed to the use of the microscope, on some of the contents of salt pools, or the objects among the mass of marine vegetation, can form any idea of its abundance in these places.

The animals of the Conchiferous tribe are headless mollusks, and are affixed to their valves by muscles which stretch from valve to valve. Shut up in their shelly homes, destitute of organs of vision, and with very limited means of moving from place to place, they can have little communication with objects around them. Many are fixed to the rocks; some, like the oyster, lie in compact beds; some fasten themselves firmly, like the mussel, to the rock, by means of chains spun out

of their own bodies, and some by the help of a foot shovel out the sands, and bury themselves in a hole of their own making. The hinge which unites the valves of the shells has a saw-like edge, or little teeth, which fit exactly into corresponding cavities. The beautifully constructed elastic hinge binds it together, and is designed for opening the shell; while the animal is endowed with one or more muscles, by which it can close it, and keep it firmly shut. The valves of some bivalve shells are formed exactly alike, while others are dissimilar. Sometimes one is smooth, the other rough; frequently, one is flat and the other convex, and often one shell is shorter than its companion.

Among the most common of our bivalves are those deeply violet-tinted shells of the common mussel (*Mytilus edulis*), which are found in great

abundance on rocky shores, fastened by no slight hold to the rocks, and, however wildly the waters may dash over them, are rarely loosened from their

moorings. But though abundant chiefly on rocky shores, yet we may find mussels, too, on low, rockless strands, lying about sometimes in such numbers as to render the shore very unpleasant by their decomposing masses. The peasants of many lands are accustomed to eat them, though on the coasts of Yorkshire the belief in their unwholesome properties is so general, that they are universally rejected by the inhabitants. The fox is said sometimes, when pressed by hunger, to leave his lurking-places and come down to the coast, to make a meal of these and some other bivalve fish, which he may chance to find there. Mussels are eaten, too, by sea birds, and are of great use as baits for fish. They are certainly eaten, year after year, with impunity by the people of some of our island shores. That, however, the mussel is, under some circumstances, of a deleterious nature, there are too many well authenticated cases on record for us to doubt. Dr. Combe gives an account of a circumstance which occurred in the town of Leith, in June, 1827, at which time numbers of poor persons became ill in consequence of eating mussels which they had gathered from the docks. So great was the excitement occasioned in the town by this event, that the magistrates issued orders, prohibiting their use as food. About thirty persons suffered from having partaken of them; some were severely affected, and two died. Some writers have thought that the illness arising from eating this food would not have occurred had not the mussels been in a state of putrefaction; others have ascribed it to the little crustacean, the pea crab, often found in the shell of the mussel. There is no doubt that the flesh of the mussel is at all

times indigestible, and probably the ordinary cases of illness are sufficiently accounted for by the fact, that the persons rendered ill by them were in a state of health little fitted for the digestion of food of this nature; but this will not account for every case. The best mussels are procured from Hambleton, a village in Lancashire, at which place, having been taken from the sea, they are put in the river Weir, where the tide can reach them, and where they become plump and of delicate flavour.

The byssus, or silky beard, by which the mussel moors itself to the stone, is a familiar object of our sea rocks. It is, in its nature, like the silk of the silkworm, or the silvery thread woven by the spider, and it exudes, in a glutinous state, from an organ at the base of the foot. A groove extends along this part of the foot, the sides of which fold over to form the little canal, along which the glutinous substance runs, which shortly acquires the consistence of a silky thread. The animal then protrudes its foot, and fastens the thread to the rock, then a fresh thread is again formed in this little groove, until the mussel has made enough for his moorings. The animal can spin many hundreds of these strong and durable silken cables, but it does not waste its powers, but skilfully adapts their numbers to its condition. When attached to a rock over which the sea-wave rushes wildly, it spins a strong and many-threaded cable; but when lying on some sheltered spot, where its dwelling is in no danger of being torn away, it spins but few. Daniel, in his "Rural Sports," mentions an instance in which the mooring of the mussel was useful to effect a purpose which human

skill could not accomplish. A large bridge, with twenty arches, in the town of Biddeford, in Devonshire, crosses the Towridge river, near the spot of its juncture with the Taw. The tide flows so very rapidly here, that it was found impossible to keep the bridge in repair by means of mortar. "The corporation therefore," says this writer, "keep boats in employ to bring mussels to it, and the interstices of the bridge are filled by hand with these mussels. It is supported from being driven away by the tide entirely by the strong threads these mussels fix to the stone-work; and by an act or grant, it is a crime liable to transportation for any person to remove these mussels, unless in the presence and by the consent of the corporative trustees."

The Indian tribes of America, when deliberating on important matters, ratify their agreements by an interchange of strings or belts of wampum, The string is simply a cord, on which are strung several square pieces of mussel-shell. The belt consists of many of these strings, and each has its appropriate meaning. When intentions are not pacific, defiance is expressed by a figure of the tomahawk, rudely sketched on the piece of mussel-shell. And then follow the savage war-whoop and the wild dance, and all the precursors of barbarian warfare, the records of which would fill us with unmingled horror, but that we have sometimes to contemplate instances of an heroic spirit triumphing over bodily suffering, which, in a better cause, were worthy of highest admiration. The mussel-shell, too, is, among these tribes, often the record of past treaties, and is brought forth occasionally, year after year, that the old man

may remember, and the young may learn, the history of his tribe; and as it is handed round the assembly, each one reads the hieroglyphics traced there, significant to the savage as is the written document to the civilized man.

The shell-fish called the Pinna is less common on our coasts than the mussel, and has a frailer shell, the two valves of which gape open at one end. It is of a fan shape, and larger than the mussel-shell. Indeed, the Huge Pinna (*Pinna ingens*), a native of the British seas, has a shell twelve inches long, almost triangular in shape, and horn-coloured. The threads by which the different Pinnæ attach themselves to rocks in the sea, are much larger than those spun by our common mussel, and in Italy are woven into a silken fabric. They are of a fine glossy brown colour. The ancient Romans greatly prized articles manufactured from this byssus, and at Naples and Palermo, stockings, gloves, and a silky-like fabric have, even of late years, been made from it. The Italians have also fabricated a substance of it, in some measure resembling our broadcloth, but it is so expensive that a coat of this material costs about ten pounds of English money. Stronger still is the byssus of that shell of the Indian seas, called the Great Clam, whose silvery inside often shines among the shells of grottos. The cable attached to this sometimes supports a shell of the weight of four hundred pounds, and repeated strokes of the axe are needed, ere the animal can be dislodged from its hold.

But of all the common shells which the tide throws over the shore, none is more general than that of the oyster (*Ostrea edulis*). There it lies,

whitened by sunshine and rain to the colour of snow, crowded sometimes with the twisting shelly tubes of the Serpula, or pierced in a thousand holes by minute sea-worms, or forming a ground-work for a little grove of plant-like corallines, or for the mossy tuft of sea-weed. A strong and tough shell it is also, and useful, as we see, to other animals besides the one which made it for its dwelling. We all know the worth of the inmate. The Greeks and Romans valued the oyster very highly, and their epicures spared neither trouble nor expense to procure those which they considered the finest flavoured kind. They were good judges too, if we may trust the satirist Juvenal, who, in describing an epicure, says:—

> "He, whether Circe's rock his oysters bore,
> Or Lucrine Lake, or distant Richborough's shore,
> Knew at first taste."

They procured them from the Dardanelles, from Venice, from the Bay of Cumæ, and from England, and valued most those which were brought from different lands, and afterwards fattened in the Lucrine Lake. It was a Roman also, Sergius Orata, who first thought of this plan of making artificial beds, and turning oysters into "natives." Oysters dwell in the ocean, some lurking in the sands, others adhering to rocks; while on the shores of the West Indies a species attaches itself in thick clusters to the large roots of the mangrove trees, which grow in groves around the sea. The finest edible oysters are those of Britain, and they are frequent on many parts of the shores of this island. At Milton, in Kent, as well as many other places, large beds are formed of them. They

lie there with their flat shells uppermost, that the animal may breathe by opening its shell, and gather in thus its food from the water; and the fishermen who have looked down through the clear waters into these oyster-beds, state that the animals are so sensitive, that if even the shadow of a boat passes near them, they instantaneously close their shells. Designed as they are to be the food of man, as well as of fishes, birds, starfishes, and zoophytes, they are most wonderfully prolific. It is stated by Poli that one of these shell-fish contains 1,200,000 eggs, so that a single oyster might furnish enough to fill 12,000 barrels.

The structure of the bivalve mollusks is beautifully fitted to their condition. On gently opening the shell of an oyster, we find within, a membrane, in some species having a delicate fringe of little threads. This membrane is the mantle from which the animal secretes the outer layers of its shell, in such manner as to admit of its being made larger as the shell-fish grows. Between the leaves of this mantle lie four delicately fine membranous leaves, composed of slender fibres. These are the branchiæ or gills, the aërating organs, and the mouth is placed between the innermost of these leaves. But these gills have another office to perform, besides that of preparing the blood for use. They are the organs by which the mollusk procures its food. Shut up in its cell on the sea-rock, or lying, during life, on the bed where it grows, the oyster might seem to be little fitted for making any effort to secure its prey. But the filaments of these gills are thickly covered with minute cilia, or fringe-like hairs. The incessant action of these cilia causes successive currents of water around

them, and thus the animalcules, with which the water is full, are brought to the lips of the animal, which are so sensitive, that they admit or reject what would nourish or what would be useless. Small as the cilia are, they are visible only when seen by the microscope, and none except those accustomed to make microscopic observations can imagine their use, not to molluscous animals merely, but to zoophytes, jelly fish, and a vast number of marine creatures. The strong and rapid currents which these cilia make in the water cannot be imagined by those who have not witnessed the little whirlpools caused by their perpetual motion. Even after the shell is closed over water previously admitted, their vigorous action never ceases; and when a portion of the branchiæ is cut off, still the cilia move up and down, as long as any vitality remains, and acting as paddles to the part on which they grow, they row it through the water so quickly, as that one might fancy the detached piece to be a separate and living animal. In the mass of the body lie the heart, the stomach, the liver, and other viscera; and such, with some slight variations, is the general structure of the great number of bivalve mollusks.

That beautiful mother-of-pearl, or *nacre*, of which so many ornamental objects are made, with its glistening silvery surface, tinted with rainbow hues, consists of layers of membrane in conjunction with particles of lime. These bright colours have been proved to be the effect of the parallel grooves which are caused by the regular arrangement of the successive deposits of shells. A similar effect may be produced with other materials similarly arranged, and casts of the surface of mother-of-

pearl, made of gum arabic, sealing-wax, or shell-lac, have been made to assume the shiny appearance of that substance. Pearls are secreted, not only by the oyster and mussel, but also by several bivalve mollusks; and they are of the same substance as the nacre, consisting of animal matter and carbonate of lime, arranged in concentric layers around a nucleus. They appear to be originated by some local interruption to the comfort of the animal. Thus small grains of sand by some accident get in between the valves of the shell, and become encrusted with layers of nacre, slowly increasing and assuming the round shape of these beautiful gems; or the annelidous worm pierces a hole in the shell, and the oyster forms a little plug to stop up farther intrusion. Linnæus said that he could make pearls at pleasure, by perforating the shell with a pointed wire, and introducing grains of sand.

"Pearls," says Mr. Gray, "are usually of the colour of the part of the shell to which they are attached. I have observed them white, rose-coloured, purple, and black, and they are said to be sometimes of a green colour. They have also been found of two colours; that is, white with a dark nucleus; which is occasioned by their being first formed on the dark margin of the shell, before it is covered with the white and pearly coat of the disk, which, when it becomes extended over them and the margin, gives them that appearance."

The frequent mention of pearls by the Scripture writers, shows how highly they have ever been esteemed among Oriental nations. Indeed, in the East, they seem to have been prized even more than the brilliant diamond. "In the West," says

Heeren, "the passion for the elegant luxury was at its height about the period of the extinction of Roman freedom, and they were valued in Rome and Alexandria as highly as precious stones. In Asia this taste was of more ancient date, and may be traced to a period anterior to the Persian dynasty. A string of pearls, of the largest size, is an indispensable part of the decorations of an Eastern monarch. It was thus that Tippoo was adorned when he fell before the gates of his capital; and it is thus that the present ruler of the Persians is usually decorated." Pearls have one disadvantage, however, that they lose their lustre in the course of years, especially if worn near the skin. The pearls found in our native species of oysters are far inferior to those brought from the Persian Gulf, from Ceylon, or any of the Oriental pearl fisheries, and have, generally, a milky and more opaque appearance.

We have several British species of oyster, and the shells of some of those of distant countries are highly prized by conchologists. A shell termed the hammer-oyster (*Malleus vulgaris*), from the Indian seas, is not uncommon in collections, and in some specimens the shell is shaped so much like a hammer as to lead to its immediate recognition.

Several species of the scallop are abundant in our seas, and their shells are strewed about on our shores. Cuvier called these shells the butterflies of the ocean, not so much because, when the two valves are expanded, they in some respects resemble the wings of our summer-insect, as that they exhibit such various and beautiful colours. Numbers of the little shells belonging to the speckled scallop (*Pecten varia*), are to be found on almost any part

of the sea-side, where a ridge of sand borders the ocean. They are often about two inches and a quarter long, variously clouded and speckled with a variety of colours, most generally of an orange brown tint, though sometimes of purple or voilet, and marked with about twelve ribs.

Our wood-cut represents the large scallop (*Pecten maximus*), which, though not general on

all our coasts, is plentiful on many; and its fish, as well as that of several other of the species, is used for food. In former days its flat valve served for the dish, and its hollow one for the cup, at the feast to which the less polished inhabitant of our island once invited his friends, when, in the words of Ossian, "the joy of the shell went round." Either this shell, or the species termed *Pecten opercularis*, was also, in former days, the badge of pilgrimage, when men travelled wearily to the sites of the histories of Scripture, there to

perform some superstitious vow, or, perhaps, with the view of making merchandise. This pilgrim shell, affixed to the front of the hat, is frequently adverted to by our older writers. Thus we have Ophelia's song:—

"How should I your true love know
From another one?
By his cockle-hat and staff,
And by his sandal shoon."

And in that quaint old poem of Sir Walter Raleigh's, entitled "The Pilgrimage," beautiful, but fanciful, we have an allusion to this:—

"Give me my scallop-shell of quiet,
My staffe of faith to walk upon;
My scrip of joy (immortal diet);
My bottle of salvation;
My gowne of glory, hope's true gage,
And thus I'll make my pilgrimage.
Blood shall be my body's balmer,
While my soul, like a peaceful palmer,
Travels towards the land of Heaven."

After a stormy day, when more shells than usual have been dashed by the waves on the strand, we may often pick up some of the different species of *Anomia*, or silver oysters, as they are called by people on the Kentish coast. This shell has one valve flat, and the other gibbous, and one of the valves has often a small hole just at the base. These shells are so transparent and wrinkled, that if we found only one valve, we might almost imagine it was the pearly lining of an oyster-shell, detached from its place. The waved anomia is about one inch and a half wide, marked with fine irregular thread-like lines crossing curved ones, and it is inside of a beautiful pearly green colour. In some parts of France its fish is esteemed a

delicacy. Both this and the saddle anomia (*Anomia epiphippium*) may be met with attached to the oyster and other shells. The mollusks fasten themselves thus to shells, stones, or sea-weeds in the sea. The latter species sometimes sufficiently resembles a saddle to deserve its familiar name. The upper valve is convex, the under flat. The inside of the shell is beautifully pearly, exhibiting very lovely tints of green, purple, or yellow. It is of a much larger size than the waved species.

Some species of the Noah's Ark shells are found on various parts of our coast, but they are not very general, though we may often find, in our rambles on the sandy shore, the little species called the silvery ark (*Arca nucleus*), with its somewhat triangular and slightly convex shell. This is covered with a smooth olive-green skin, and when this is removed, the shell is seen to be white with olive rays from the beak to the margin, and often marked with flesh-coloured and bluish transverse bands, and a few coarse ridges. It is usually rather less than half-an-inch round, and its internal part is beautifully white and silvery. The larger Noah's Ark (*Arca Noæ*), so common in collections, of a deep umber colour outside, and having a pure white interior, is also found on our coasts; but the largest specimens, of two or more inches broad, are brought chiefly from the shores of the Atlantic.

Every one who has noticed the rocks about our sea-shores, within reach of the tide, must have seen how they are often pierced with large holes, which seem as if the rock had at one time been soft, and that these smooth hollows had been made by putting some round object, as a stick, into

them. The apertures which lie exposed to the surface are often empty, or contain shells in which the fish are dead; but break away a crag from these pierced rocks, and we shall find numbers of living shell-fish shut up within. These are the different species of Pholas, well-named from the Greek word *pholeo*, "to hide," for they live and die buried in their homes in the rock, save when some naturalist brings them out for observation, or the fisher goes and collects them for bait. It is wonderful to look at their frail delicate shells, and see how they can make their way into rocks, hard clay, limestone, and wood, enlarging their cavity as they increase in size, and clustering in multitudes in the wood-work of piers, sapping the foundations of jetties, boring into the hulls of ships, and, if their ravages are unperceived, causing the shipwreck of the mariner, and the destruction of the works of man's art. How creatures apparently so helpless, and with such fragile shells, should accomplish this, is yet a mystery. Hidden as they are, within their rocks, our means of observation on their habits are very limited. Some naturalists think that they pierce the hole by the rotatory movements of the shell within the cavity, yet one would think that a slender shell would rather break than force its way into a hard rock. Others, familiar with the action of minute cilia in causing currents in the water, have thought that the Pholas, by producing these currents, wore away the stone. Yet this force, powerful as it is in entangling animalcules, is not great when directed against a firm object, and one can hardly imagine that the forest tree, lying on the shore, and filled with these piercers—a tree whose

wood was hard and firm, and whose constituent fibres adhered so closely—can have been perforated thus. Other naturalists believe that some chemical solvent is possessed by the animal, which exudes from it, and causes the cavity by dissolving the rock. But this idea has its difficulties too, and we ask how the solvent which destroys carbonate of lime, should leave the shell uninjured, and how the same chemical substance which dissolves limestone should act in a similar manner on wood and clay. Each solution of the mystery has its difficulties, and it remains yet an unsettled question, by what means these dwellers in the rock effect their purpose.

The Pholades emit a most remarkable light. This secretion not only shines during darkness, but illuminates whatever it touches or happens to fall on. "There is," says Dr. Priestley, "a remarkable shell-fish, called *Pholes*, which forms for itself holes in different kinds of stone. This fish illuminates the mouth of the person who eats it, and it is remarked, that contrary to the nature of other fish, which give light when they tend to putrescence, this is more luminous the fresher it is, and when dried, its light will revive on being moistened either with salt-water or fresh; brandy, however, immediately extinguishes it."

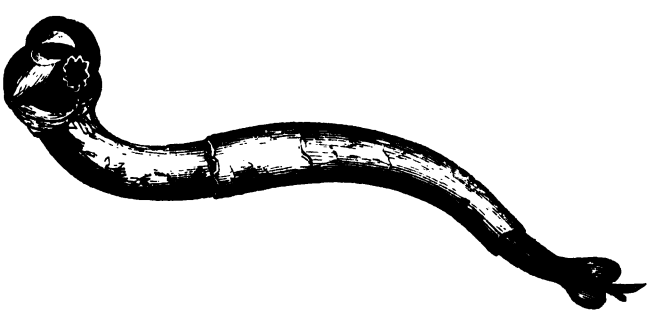
Whether this light is, or is not phosphorescent, yet, that this secretion does not effect the cavity, seems apparent, because, as it is always present, it would be perpetually decomposing the rock; whereas the size of the cavity is increased at the will of the animal, and is only made so large as to enable it to move round in it. Our figure represents a group of the common stone-piercer, or

prickly pidduck, or prick-stone (*Pholas dactylus*), a valuable animal to the fishermen of our coasts, as it is extensively used for bait. In some countries it is eaten as food. Indeed, all the mollusks of

the bivalve family might be eaten; as there are none which are known to be poisonous, though many are somewhat indigestible, and a few are of unpleasant flavour. A general description of the shell of this species will suit, more or less, several others of the genus Pholas. It is so fragile, that it may be easily broken, and a thicker shell would only encumber an animal shut up in the rocky seclusion. It is white, thin, and in its early stage transparent, about one or two inches in length, and the two large valves, instead of fitting into each other, are open at both ends. Just inside of each of these valves is a little spoon-shaped piece. Besides this, the shell has several lesser pieces, or

valves near the hinge, which, however, sometimes fall off, and are so easily broken, as that they cannot be relied on as characteristic. The shell is marked with ridges set with prickles, which are thicker and larger at one end than the other. The animal has a long siphon, and if we place a stone-piercer in a vessel of water, it will elongate this wonderfully.

The Pholades are not the only family of mollusks which pierce their way into stone and wood. Not less remarkable are the boring powers of some of the genus Mya, and the Rock-boring Venus, and others which dwell in cavities exactly fitted to their shells. The well-known Ship-worm (*Teredo norvagicus*, or *navalis*, as it is often called), is very



destructive to submerged wood, insinuating itself into the bottom of ships, even when the oak is perfectly sound, and by its ravages destroying many a noble vessel, a valuable floodgate, or substantial pier. The teredo works with astonishing rapidity, and will completely riddle a hard and sound piece of wood, in the space of five or six weeks.

The ravages of this animal were so extensive in the dockyard at Plymouth, that in the course of four or five years it became necessary to remove the wood which it had penetrated. The very submersion of Holland has seemed at times probable, from its destructive effects; and in the years 1731 and 1732, great alarm was excited in the United Provinces, by the discovery that the teredo had so injured the piles which support the banks of Zealand, as to threaten them with entire destruction. Happily, however, after a time, it disappeared, no one could tell why, unless it might be, that the winter having been unusually severe, it was unable to live in that latitude in such extreme cold.

Linnæus called the teredo the *Calamitas navium*, and common as it now is in all the seas of Europe, yet it was formerly believed to have been introduced into them, during the last century, from the East, though several species are now considered as natives of Britain. On examining the piers and woodwork about our harbours, we shall too often find specimens of this animal embedded in it. Little canals are formed by it in the wood, sometimes one or two feet long, not always straight, but bending according to the grain of the wood. Inside of these the worm-like animal lies enclosed, usually in a shelly case, secreted by its mantle, but to which it is not attached by any muscles. The true shell is at the end of this ivory case, and consists of two valves, by means of which the teredo cuts its entrance into the wood. The body is a long worm-looking object, and is merely an extension of its two siphons, or tubes. Happily, the teredo, like many other

firm strong shells, which might be dashed up and down in the waves without injury.

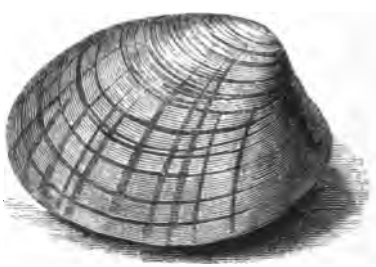
Another common genus of mollusks, whose shells lie about on sandy coasts, contains the different species of *Solen*, or Razor-shells. The animal is provided with a cylindrical foot, admirably adapting it for burrowing in the sand. This organ tapers at the end, and is, however, more shaped like a tongue than a foot. Destitute of a cable to move it, or a strong shell to protect it, this little foot supplies all needs of the mollusk; and the depth into which, by its help, this animal can retreat into the sand, is truly wonderful. It often buries itself several feet below the surface, rendering its capture scarcely possible. When about to enter the sand, the foot of the Solen takes the form of a shovel, with a sharp, pointed end. With this it digs a hole, turning its point into the form of a hook to facilitate its descent, and again widening it into the spade-like shape to shovel away the sand. If it wishes to remove to a little distance, the Solen can double up its leg into the form of a ball, which prevents it from slipping back, while the action of powerful muscles impels it forwards. Supplied with so admirable an organ, the Solen is by no means an easy captive, and buried upright in the sands, the fishermen who catch them need both skill and practice. The fish is sometimes eaten by the poor inhabitants of sea-side places, but it is of especial value as bait. In Ireland, however, one species, the *Solen siliqua*, is in so much request, that the Irish peasantry have a song, which they sing in chorus, when they go out to catch it. The fishermen take the Solens at high tide, and plunging a slender iron rod into the

sand, pierce the animal, and bring it to light. The slight motion of the sand, made by the foot, sufficiently alarms the fish to induce it to throw out jets of water, or it would lie secure enough, for the holes are not often easily discovered. In some cases salt is thrown into the cavities, which so irritates the fish, that it immediately comes to the surface; but the eye must be watchful, and the hand must be ready, which is to secure it, as, if not seized instantly, it plunges down again, and no subsequent irritation from the salt will induce it to come out to face farther danger. The French call the Solen *Manche de couteau*, from the shape of its shell. Several species are found on our coast. Our figure represents the common Razor-shell (*Solen ensis*).

Not less difficult of capture, from the depth in which they bury themselves in the sands, are the different species of Mya or gaping-shells; so called because at one end the shells, instead of meeting, gape open. The sand mya (*Mya arenaria*) is a common shell-fish on our sandy coasts, making holes under the sand, which it betrays by occasionally putting out its proboscis. This genus is interesting, as including the pearl mya (*Mya margaritifera*), sometimes called *Unio elongatus*, which, however, is not a marine animal, but a native of rivers. The pearls produced by this fish are very valuable; several pearls of great size

have been procured from the rivers in the counties of Tyrone and Donegal, in Ireland. "One of them," says Captain Brown, quoting from the Philosophical Transactions, "weighed thirty-six carats, and would have been worth 40*l.*, but owing to its being impure, it lost much of its value; other pearls from the same places have sold at from 4*l.* 10*s.* to 10*l.* each. One of the latter price was sold a second time to Lady Glenlealy, who had it placed in a necklace and refused 80*l.* for it." This writer adds, that there was a great fishery for pearls in the river Tay, and that pearls sent from thence for the years 1761 to 1764, were worth 10,000*l.*, while the pearls in the Scottish crown, forming part of the Regalia, exhibited in the Castle of Edinburgh, are the produce of the river Tay. County tradition tells us that a pearl found in this pearl mya in the river Conwy in Wales, was presented by Sir Richard Wynne of Gwydin to the Queen of Charles II., which was afterwards placed in the royal crown.

Our engraving exhibits a very pretty shell, the

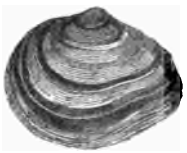


Chione Venus (*Venus chione*) very common on the coast of Cornwall, and often found too on many

parts of our shores. It has a thin glossy skin over it, of a chestnut brown colour, but when this is rubbed off, we see it to be beautifully marked and of a pale purple tint; and it is capable of receiving a high polish. Several other species inhabit the British seas. The Golden Venus (*Venus aurea*) is a shell, about one inch and a half long, of a beautiful golden yellow. Several of the species of this genus pierce stones and masses of coral, and the boring rock Venus, is a native of many of our rocky shores.

Some very pretty little shells of the Donax family are among the very commonest of those which we meet when we ramble along the sands. They may be described as triangular, flattened and wedge-shaped. These shells bury themselves in the sand, often to the depth of sixteen fathoms, with the short end of the shell uppermost, in order to admit the entrance of the sea-water, through the respiratory siphons of the animal within. Our figure represents a shell often found when the tide has receded from the sands, and there are few sandy shores along our island, where it is not plentiful; it is the truncated Donax (*Donax trunculus*), an oblong, glosssy shell, with fine thread-like lines, from the base to the hinge, which are crossed by purple bands, and also rayed with purple. The interior is white, often tinged with a purplish hue, and the edges of the shell are finely notched with little rounded notches. It is, on this account, commonly called the saw-shell. Some other of our British Donaces are more distinctly wedge-shaped than this. They are all small shells.

Several species of Tellina are also among our common shells, and are generally found with the Donaces buried in the sand, or left by the waters on the shore. Many of them are much thinner and clearer shells than the Donax, and beautifully marked with pale or deep rose-colour, and various shades of purple, yellow, and buff. Our figure represents the common Tellina (*Tellina carnaria*), usually called the butter shell, and marked with pale flesh-coloured bands. It is a thicker, firmer shell than most of the genus, and among the most frequent on our sandy shores.



More highly organized than the inhabitants of bivalve shells, are the univalve mollusks, composing the class Gasteropoda. This name refers to the broad expansion on the under part of the body of the animal, which is called a foot; and the snail, as it creeps over our plants, makes use of this organ, and exhibits its form to us. The Gasteropoda is a large class, including not only the univalved shell-fish, but a number of animals, which, like the slug, have not a calcareous habitation. The mollusk of this class is far more symmetrical in form than that of the Conchifera. It has a clearly marked face, with two or four tentacula, like the horns in the snail, which have either eyes at the summit, or, as in most of those belonging to the sea, at the base of these organs. Zoologists arrange this class into several orders, according to the form and situation of the gills by means of which they breathe. Those which breathe air, like the snail, have a delicate network,

like the lungs of other animals destined to inhale atmospheric air; but the Gasteropoda, formed to inhabit the sea, have gills or branchiæ placed on different parts of their bodies. The structure of some of these gills is exquisitely beautiful. In some they form a number of rays, like a lovely flower, on the back of the animal: in others they are like long rows of leaflets: while in many they are shaped like the teeth of a comb, thus forming good characters for a scientific classification.

Every one is familiar with some of the common shells of the animals of this class. Our beaches are strewed with them, they lie among our rocks, and some are found on our sandy shores. Many little shells of great beauty lurk in the heaps of drifted sand, or hang about the roots of sea-weeds, needing a microscope for their examination. Not a lake, or pond, or ditch but has its own tribes lying among the mud at its base, or hiding among the plants which surround it, or forming a carpet on its surface. Land shells, too, of this order exist everywhere, and the bitten leaves of our choicest garden flowers, too often leave the silvery traces of the snail or slug, which has remorselessly made its meal upon them during the rainy day or the moist evening. The sea itself has its myriads of these animals, and a greater number of genera and species belong to this class than to the Conchifera.

All who have wandered among the rocks on our shores, know that univalve so frequent upon them, the common Limpet (*Patella vulgata*), which adheres as firmly to the rock as if it were a portion of it, while its empty shells, like so many little cups, lie strewed around. It is often completely

embedded in a cavity which it makes, of exactly the size and form fitted to hold its shell. So firmly can it attach itself, that if by any movement of the hand we allow the animal to guess at our

intention of taking it, it becomes almost impossible to tear it away, unless by putting the blade of a knife between it and the stone. The power of holding itself thus is owing to the great number and strength of the fibres of its foot, which by raising the middle part, form a hollow in the centre and act as a sucker. This means of adhesion protects the limpet not only from the violence of the waves, but also from the strength or skill of the numerous birds and animals which relish it as food. There are many species of limpet, but even the practical conchologist finds some difficulty in distinguishing them from each other, on account of the power which the animal has of altering its shell to suit its circumstances, adapting the rim to the shape of the substance on which it is found. Thus, when a limpet makes a dwelling-place on the leaf of a large sea-weed or on a flat

stone, the base of the shell is flattened, and the mouth roundish; but if it grows attached to some crag, or on the cavity of some refuse shell, the base is flat and internally convex, and as the limpets move from place to place, several changes may occur in the form of the same individual shell. Some species seem to move continually from one reef or rock to another, but others are fixed, and appear to depend for sustenance on such food as the wave may bring them. Yet it is generally believed that they can eat marine plants, and the long and curiously formed tongue of our common limpet, armed with spines and tiny hooks, is a wondrous piece of mechanism, admirably adapted for sawing the sea-weeds into little pieces.

The Patellæ are found on rocky coasts, on almost all shores, excepting those of the Arctic seas, and as they grow to a much larger size on tropical rocks, they form a most valuable article of food. Even our smaller native species are of great value in some parts of this kingdom, and the peasantry of the Western Isles of Scotland look to the periwinkles and limpets which abound on their rocks for their daily meal, often for long seasons, subsisting almost entirely upon this humble food. In the Isle of Skye the inhabitants are often, at one time of the year, without any other source of provision. Darwin, in his *Journal of Researches*, describes the poor people of Tierra del Fuego as living almost entirely on the molluscous animals which they can gather from their rocks. "Whenever," says this writer, "it is low water, winter or summer, night or day, they must rise to pick up shell-fish from the rocks; and the women either dive to collect sea eggs, or sit

patiently in their canoes, and with a baited hair-line, without any hook, jerk out a little fish." These poor creatures often suffer severely from famine, when, by a succession of strong gales, they are prevented from reaching the rocks on which the limpets grow.

Nor was the limpet destined for the food of man only. The sea-gulls and ducks feed on them, while the pied oyster-catcher receives its name from its habit of devouring the oyster and common limpet. The bill of this bird is admirably constructed for opening the valves of the one, and loosing the other from its hold on the rock, while the crow, not thus favoured, has recourse to a device for getting at the shell-fish. "A friend of Dr. Darwin's," says an interesting writer in Loudon's Magazine of Natural History, "saw above a hundred crows on the northern coast of Ireland, at once preying upon mussels. Each one took a mussel up in the air twenty or forty yards high, and let it fall on the stones, and thus broke its shell. Many authorities might be adduced in corroboration of this statement. In Southern Africa, so many of the shell-fish are consumed by these and other birds, as to have given rise to an opinion that the marine shells found buried in the distant plains, or in the sides of mountains, have been carried there by their agency, and not, as is generally supposed, by eruptions of the sea." Crows even, and vultures, as well as aquatic birds, carry off these shell-fish, and Mr. Barrow, who is of this opinion, says that shells are thus carried to the very summit of the Table Mountain. He adds;—"In one cavern at the point of Mussel Bay, I disturbed some thou-

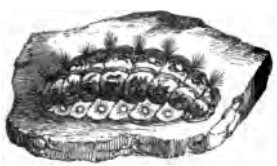
sands of birds, and found as many thousands of living shell-fish scattered on the surface of a heap of shells, that for aught I know, would have filled as many thousand wagons."

The shell of our common limpet is sub-oval, of a yellowish or greenish ash colour, and marked with many ribs. Should the reader happen to find on the frond of the Oar-weed, or any other of our large olive sea-weeds, a beautiful clear little shell, shaped something like that of the common limpet, of an olive-green colour, with blue interrupted rays, he may recognise it as the Pellucid limpet (*Patella pellucida*).

Then there are the shell-fish, commonly called the Key-hole limpets, of the genus Fissurella, some of them frequent, and all easily known by the aperture at the summit of the shell, shaped exactly like a key-hole. This aperture is exactly over the breathing apparatus, and serves to conduct the water necessary for respiration.

On the rock on which we find the limpet, we shall probably also see some one of the several species of the canoe shell, as they abound on rocks between the high and low-water marks, often being completely embedded in them. They also attach themselves to the stems of the coarser sea-weeds, and to the hulls of ships. These Chitons have a very remarkable shell, formed of eight distinct portions, arranged in a row down the back, and so similar to the plates of ancient armour, that this animal is often called coat-of-mail. When we take it up in the hand, it rolls up in a ball like the common wood-louse. It has very sharp little teeth in its mouth, with which to nibble sea-weeds or other food. The species are difficult to determine, as

the only certain character is afforded by the number of little notches on the sides of the valves, and these cannot be ascertained but by taking the shell to pieces. The tufted canoe-shell (*Chiton fascicularis*) is one of the commonest kinds, and very plentiful on our southern coasts, and may be known by the little tufts of hair around the margin of the shell. The whole surface of the valves, when seen through a microscope, appears to be covered with fish-like scales, excepting the beak, which is smooth, and of a yellower colour than the other part. The Emarginate canoe-shell (*Chiton marginatus*) is also a frequent species, and is of a dingy brown or reddish colour. These shell-fish are much larger in hot countries.



Sometimes, when wandering among the rocks near the low water mark, we find, among the groups of sea-weed, that singular molluscous animal, the Sea hare (*Aphysia depilans*). It is a kind of soft slug, of a blackish colour, tinged with purple, not of an attractive appearance, and having, besides, an unpleasant odour. A substance exudes from its skin, which in days of superstition was believed to cause the hair to fall off from the person who only touched it. The ancient writers told, that from it was produced the poison by which tyrants destroyed their victims, and relate that Nero mixed it with the food of those whom he hated, and that Titus used it to destroy Domitian. But the charges of antipathy to man, so repeatedly urged by them

against this little animal, were most unfounded, for the sea-hare is guiltless of either intent or power to injure, though, like the cuttle-fish, it has a means of defence against its enemies, in the dark purplish liquid with which it can surround itself, when threatened with danger, or when caught by the fishermen.

Our engraving represents a shell which is also very frequent on some parts of our island, and

commonly called the Torbay night-cap, or Hungarian bonnet (*Pileopsis ungarica*). It fastens itself to rocks or stones, like the limpet, delving, by some mysterious means, a cavity in the surface. This shell is usually about two inches in diameter, covered with a fawn-coloured skin, and inside very smooth and glossy, of a white or rose colour.

The shells hitherto described are without a regular spire, but many of the univalves are turbinated or spiral shells, like that of the common periwinkle (*Turbo littoreus*). This shell-fish, Le Vogneau of the French, is too well known to require any description. It abounds on rocky

coasts, and the shore near them is often strewed with its dark olive-green shells. This fish is indigestible as food, though, like the limpet, it forms an important article of diet to many people. In some places the fish is called Pin-patch, because the lid or operculum is so generally removed with a pin when it is eaten. This cartilaginous substance is attached to the foot of the animal within, and acts as a lid or door, protecting it from the intrusion of its enemies, and exactly closing up the aperture of the shell. The large whelk is also furnished with a strong similar lid, as are other species of univalves. Some of the turbinated shells have lids of this kind of a more thick and solid nature, and calcareous substance, and these were once much valued for medicinal purposes. Pennant tells us that the Swedish peasant believes, that when these shell-fish crawl high up the rocks, a storm is brewing in the south; but Linnæus quotes a Norwegian writer, who says that when the periwinkle climbs thus high, it foretells the coming of a land wind, and a calm in-shore.

A shell of a dull red, or fawn, or drab colour, very thick and shaped like that of the periwinkle, the *Turbo rudis*, is not unfrequent on our rocky shores. It is about three-fourths of an inch long, and its outer lip thick and glossy within; and several other British species may also be found in similar places.

The foot of the animals of the genus Turbo, as well as some others of this class, is so compressed as to serve as a kind of paddle in the water, while its breathing organs are little tufts like plumes on the back. These animals feed on vegetables, and are provided with a tongue, armed with very small

hooks, by means of which they catch and tear their food.

That very common shell, the Muddy-red Trochus (*Trochus Ziziphinus*), has, as well as the other species of the genus, an inmate similarly formed to the periwinkle, and like it, is a spiral shell. It is of a dull grey hue, marked with dashes of a reddish flesh-colour, or brownish pink. It is generally about an inch long. This genus received its name from the resemblance of the shells to a top. We have several native species, some of them among our commonest shells.

The grey Trochus (*Trochus cinerarius*) is very much smaller than the last-named kind, and is of an ash colour, varied with darker spots, and its spire is not so pointed; while the little spotted Trochus (*Trochus maculata*) is smaller still, and is called by children on the coast, Pepper-and-salt shell, perhaps because its colour resembles that of the cloth of that name, worn some years since. They are both very frequent on our sandy shores.

A singular shell of this genus, called the Carrier shell (*Trochus phorus*), a native of Eastern shores, is in great request among conchologists. It attaches to its outer surface as it increases in size, a variety of foreign objects, as stones, shells, and corals. The species of Trochus are very numerous, and some of them may be found in almost all seas. Fossil Trochi too are very abundant; some of them of existing species, as our muddy-red and grey kind; others of species now extinct.

Another frequent shell of our coast, is the common False wentletrap (*Scalaria communis*), which is generally of a whitish colour. Its form is sufficiently described by our engraving; the

ribs are somewhat thick and smooth, and they are sometimes marked with purple spots, while the whole shell has occasionally a pinkish purple tinge. More than eighty species of wentletrap are described by naturalists. The Royal Staircase wentletrap (*Scalaria pretiosa*), was once a rare object among collectors, and a fine specimen is known to have been sold in France for a hundred louis, and in England for twenty or thirty

pounds; but the shell, though beautiful, was prized chiefly because it was rare, and now that plenty can be obtained, a few shillings will suffice for its purchase.

There is a shell lying about most of our beaches and sandy shores, commonly called the Sea Snail-shell (*Natica monolifera*). It is shaped like that of the garden snail, but highly polished, and of a bright brown colour marked with darker streaks. The eggs of the Natica are most singular. They resemble thin cakes of biscuit several inches in diameter, which, if held up to the light, seem composed of a number of cells covered with sand.

Still more like our garden snails in the form and brittle texture of its shell, is the beautiful and fragile Oceanic Snail (*Janthina fragilis*), which is found too rarely on our shores to be named among their common productions, though it is abundant in warmer latitudes. Its shell is of a beautiful violet colour, and the little animal within is remarkable for the beautiful apparatus by which it floats gracefully along in the waters. This consists of an assemblage of air-cells, and resembles a frothy mass. This singular float has no organic connexion with the little mollusk. "It is probable," remarks Captain Cook of this animal, "that it never goes down to the bottom, nor willingly approaches any shore, for its shell is exceedingly brittle, and that of few fresh-water snails so thin; every shell contains about a tea-spoonful of liquor, which is most easily discharged upon being touched,

and which is of the most beautiful red purple that can be conceived."

But returning to the commoner objects of our native shores, the accompanying figure will at once recall to every one who has strayed along the sandy margin of ocean the form of a familiar object. Perchance it may recall the hours of childhood, when we gathered up the cowries as treasures, and long prized them for their beauty, and because they told of velvety sands on which the waves washed over them, making sweet music as they passed. The large foreign cowries too, the Map cowry with its brown or yellow marks and lines, and the Spotted cowry, and the common white Poached-egg cowry, and many others, well known by their uses in adorning our chimney-pieces, even to those who live inland, can bring their memories of childhood, when we held them to the ear listening to the music of the sea shell, so like that of the moaning surges, and dreamed that they told of the rising tide. Our philosophic poet Wordsworth alluded to this:—

"I have seen
A curious child, who dwelt upon a tract
Of inland ground, applying to his ear
The convolutions of a thick-lipp'd shell,
To which in silence hush'd, his very soul
Listen'd intensely; and his countenance soon
Brighten'd with joy; for murmurings within
Were heard; sonorous cadences! whereby
To his belief, the monitor express'd
Mysterious union with its native sea."

The little white-ribbed cowries, which are plentiful on our coast, are commonly called pigs, from some fancied resemblance in their form to that animal. The different common species are much

alike, the Louse-pig cowry, or Nun cowry (*Trivia pediculis*), represented by our engraving, being very general. It is of a pale reddish colour, with six square black spots on the back. The flesh-coloured Pig cowry is thinner and clearer, of a beautiful rose tint; and the European Pig cowry has ribbed ash-coloured or pinkish shells, marked down the back with a white streak and three black dots.

The cowries live at the base of the sea or along the shore in sands, and their beautifully polished surfaces are preserved free from any extraneous matters, by means of a membrane with which the animals are provided, and which they throw over the shells. They are found in greater number in the Tropical than in European seas, and in climes in which all the colours of nature deepen into richer and more glowing hue, they are far more highly tinted. The foreign species have been prized from time immemorial for their beauty, and the little Money cowry (*Cypræa moneta*) is used for current coin in many parts of India, in Siam, and on the coast of Guinea. Though inferior in value to gold or silver, yet so long as the shell is unbroken it will pass for money, and accounts are kept in cowries in some departments of business. This cowry is obtained from the Philippine Isles, and it is very common in this country. It is called the trussed chicken, which object it much resembles in shape. The shell is yellow or white, with a yellow ring.

Among the commonest of our marine molluscous animals is the waved whelk (*Buccinum undatum*). Its large firm shell frequently lies in

large numbers among the beach stones, and the hard indigestible fish, boiled and placed for sale in saucers, is a well-known object in London shop windows. In our walks along the shore, we see the whelk creeping about in quest of food, and he

seems to have an extraordinary appetite, making sad havoc among the shells of his neighbours, which he pierces through, and then sucks out the juices of the fish within. The mouth of this mollusk is provided with a long flexible proboscis, moveable in many directions. At the end of this is a spiny tongue, with which he drills and rasps away the hole, and reaches the animal within in spite of a calcareous covering, which would have seemed a sure safeguard. This whelk is often called, by the fishermen, the Conch, or the Buckie. The shell is about four inches long, of a brownish or yellowish white colour.

Scarcely less common on most parts of our coast, is the Stone, or Dog whelk (*Buccinum lapillus*), sometimes called the yellow-bandy, from the spiral bands of dark orange or yellow which

often surround the shell. This is usually about an inch in length, of yellow, white, chestnut, or dull orange colour: in its perfect state much wrinkled, but often worn smooth. This whelk is found on rocks at low water, and its fish is interesting, because it is believed to have been one which afforded that rich dye by which the ancient Tyre, whose merchants were princes, was so enriched. The ancients included under the word which we translate purple, a variety of tints, and applied it to the crimson and scarlet, and much paler shades of these hues, derived from shell-fish, as distinguished from vegetable dyes. Pliny, from whose writings much information is to be gathered on this subject, tells us that the juice being extracted from the small sac in the throat of the fish, was mingled with salt and boiled. The flesh which adhered to it was strained off, and the wool plunged into the liquid dye. Several shell-fish, doubtless, contributed these purples, but Pliny ranges them all into two classes, one of which, he says, was found on cliffs and rocks, and yielded a dull blue dye; which he compares to the tint of the raging sea; the other, the *Purpura*, the proper purple shell, taken by fishing in the sea, yielded the rich crimson hue, which he likens to that of rich red roses, or to coagulated blood. This was the valued ancient purple colour. There is no doubt that the ancient Tyrians used a species of rock-shell common all along the shores of the Mediterranean, the *Murex trunculus*, in their dye, as Wilde found a concrete mass of the shells in some of the ancient dye-pots, sunk in the rocks of Tyre. The dye was very costly, owing to the small quantity which could be procured from each fish, and to the many

processes which were used in the dyeing. In the time of Augustus, one pound of wool dyed with the Tyrian purple, could not be bought for thirty pounds. But when once stained, the colour was permanent, for Plutarch relates that the Greeks found in the treasury of the kings of Persia a large quantity of purple cloth, which was still rich and beautiful, though it was one hundred and ninety years old.

It was not until the year 1683, that our common dog whelk was known to furnish the purple dye. In that year Mr. William Cole, who is described as a lover of Natural History, heard that a person living at a sea-port in Ireland had dyed fine linen of a deep and durable crimson colour; he, upon inquiry, ascertained it to have been yielded by this whelk. He found that the juice, when taken from the vein in the neck of the fish, and squeezed on silk, acquired, on exposure to the sun, a pale yellowish-green hue; that it then changed to blue, finally to a deep purple tint, and that on washing the cloth with scalding water and soap, it became of a rich crimson. When the linen was marked with the juice, it yielded a strong odour, like that of garlic and *asafœtida*, and as a similar scent is stated by the ancient writers to have attended the process of their purple dyeing, this seemed to confirm the idea that this shell-fish was at least one of those formerly used for this purpose. The eggs of this mollusk are very remarkable. They are found in little clusters, and look like a number of little vases on stalks, all standing near each other. They are of the colour and size of grains of wheat.

One other common kind of whelk is well known

—it is the Netted whelk (*Buccinum reticulatum*), a firm shell, much smaller than the preceding species, though shaped much like them. Its surface is marked with lines from the base to the summit, and again with lines around it, which crossing each other, gave it its name. It is of a yellow colour, often tinted with an ashy grey, and about an inch long. Several of the different species of rock-shell, or Murex, are common on our shores. The shells are somewhat similar to the whelks in form, but thicker and more wrinkled. Like the whelks, they seem destined in an especial manner to prevent the bivalve mollusks, and other shell-fish of their own class, from becoming so abundant as to fill our seas. They are all carnivorous, and consume a large amount of prey, which they get at by boring holes in the shells of the helpless creatures destined for their food. Some of them, as the Humble murex (*Murex despectus*), common on our shores, serve the fishermen for bait.

Our figure represents a very pretty shell, not

uncommon on some of our rocky shores. It is the Pelican's-foot strombus (*Strombus pes-pelicanus*). This shell, in its younger state, has not the

spreading portion, and is often mistaken for that of some species of whelk. Even in a later stage of progress, it is again very dissimilar to the fully formed shell, and we might pick up three specimens so differently formed, as that an inexperienced conchologist would deem each to be of a different species. Some of the foreign kinds of Strombus are very large and handsome shells, and some species are known to have produced pearls.

Another common univalve may be easily described. This is the Tooth-shell (*Dentalium entalis*), which is just like a little horn in shape, hollow, slightly curved, open at both ends, about an inch and a half long, and of a white or yellowish colour. Its polished surface is sometimes marked with rings of yellow or brown. It is found on sandy shores, placed in a perpendicular position in the sand or mud. Some species of the Tooth-shell are found in the seas of almost all countries. The animal which inhabits this shell is of a conical form, with an enlongated fleshy foot. It has beautiful thread-like tentacula on the back of its neck, which are its breathing organs, and serve to entangle its prey.

But we must pass on to another order of Mollusca, the cuttle-fish tribe, *Cephalopoda,* which exhibit a far higher order of organization than the animals of any other division of this large class. In these only are to be found the rudiments of an internal skeleton. There is a skull containing the brain, distinct organs of hearing and smelling, and eyes very superior in structure to that of any other of the mollusca. The term *Cephalopoda* signifies head-footed, the feet of the animal being placed round the head. These feet are of great strength,

and have horny suckers in rows, there being in the common cuttle-fish no less than two hundred and forty distinct suckers on each of these flexible and muscular limbs. By means of these the animal seizes its prey, and firmly holds any object within its grasp. This tenacity of hold renders some of the species of this group so dangerous, that they have power to excite terror in the breasts of those not easily dismayed by the sight of the monsters of the deep; and the prey of the cuttle-fish can often be extricated from its clutches, only by cutting away the limbs which encircle it.

One of the commonest kinds of cuttle-fish, the Poulpe or Preke (*Octopus vulgaris*), is a familiar object on many parts of our coast; but its appearance would not invite to a farther acquaintance. It has really a fierce and evil look, as, with a fixed gaze, it stares at us from the sands, moving its long muscular arms in all directions. Nor would it be very desirable to come within the grasp of these arms, for their touch is said to cause pain and inflammation to the human limb; and as to the luckless fish which they encircle, no power of escape remains to it. Held fast by the suckers, it is dragged to the mouth, and voraciously eaten. The mouth of all the species is furnished with a firm strong beak, like that of a parrot, and with this the Poulpe breaks into the hard shell of the crab, rending its coat of mail in pieces, and swallowing the defenceless prey, watching with its staring eyes, until another and another crab has come within its reach and satisfied present hunger. Among all the molluscous animals the cuttle-fishes stand pre-eminent for their voracity. The different species of *Octopus* crawl along the bottom of the

sea, feeding even upon the largest crustacean animals, which have no chance in a contest with them; and the fishermen of the Mediterranean dislike them so much, that they regard them almost as the evil spirits of the waters. In the summer season, few of these animals can be drawn up from the ocean without showing, by their mutilated condition, the enemies with which they have contended. The early naturalists believed that the cuttle-fishes entrapped their prey, in some measure, by stratagem; and a writer in Loudon's Magazine of Natural History quotes Holland's Pliny on this old notion. Of the cuttle, he says, "And albeit, otherwise, it be a very brutal and senselesse creature—so foolish withal, that it will swim and come into a man's hand—yet it seems after a sort to be witty and wise, keeping of house, and maintaining a familie; for all that they can take, they carry home to their nest. When they have eaten the meat of the fishes, they throw the empty shells out of dores, and lie, as it were, in ambuscade behind them, to watch and catch fishes that swimme thither." Pliny also adds, that the Cephaloda are "most desirous and greedie of cockles, muscles, and such-like shell-fish, and in order to get them they lie in wait to spie when the said cockles gape wide open, and put in a little stone between the shells; but yet beside the flesh and bodie of the fish, for feare lest if it touched and felt it, she would cast it forth again. Thus they thieve, and without all danger, and in securitie, get out the fleshie substance of the meat, to devour it. The poor cockles draw their shels together for to clasp them better (as is above said), but all in vaine, for by reason of a wedge between, they will not meet nor come neere together. See how

subtle and craftie, in this point, those creatures be, which are otherwise most sottish and senselesse." Alas! for these old romances, they have all passed away as the light of science has increased, and we must be content to believe that the marvels performed by the cuttle-fish, are wrought rather by dint of his strong arms than his cunning head.

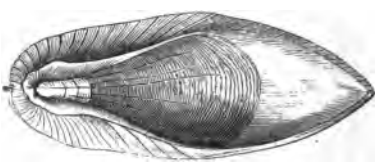
None of the cephalods are, in our seas, dangerous to man, but the natives of the shores of the Indian seas have good reason to regard them with dread, never going out in a boat without providing themselves with an axe, by which they may cut away their formidable arms. Even on the shores of

CUTTLE-FISH (*Sepia officinalis*).

Sicily, Mr. Swainson saw cuttle-fish, two of which would be a good load, their arms being as thick as those of a man; and in the hotter latitudes, gigantic creatures of this family spread terror

wherever they appear. Men who have been rescued from their grasp have afterwards become delirious and died.

Scarcely more pleasing in appearance than the common poulpe, is the Cuttle-fish (*Sepia officinalis*) so frequent on our shores. Its form is oblong, and its colour a dull white, spotted with red and brown. It is about a foot long, and of a soft jelly-like substance. The shell, instead of being like that of the other shell-fish, an outer covering, is, in this animal, an internal plate, enabling the fish by its buoyancy to rise in the water, and also giving firmness to its soft and jelly-like body. This shell is well known to all



accustomed to walk on our shores, on many parts of which it is, in rough weather, strewn in great numbers. One side is a white firm shell, but the under part is formed of thin delicate layers, of a shelly nature. This was formerly much used for pounce, and the ancients attributed to it great medicinal virtues. It is still sometimes powdered and used as a dentifrice. The sharp, strong, pearly eye of the cuttle-fish is worn in some parts of Southern Europe as an ornament, and, strung in numbers, makes a necklace of pearls, so that the animal, like the

"envenom'd toad,
Wears yet a precious jewel in his head."

Besides his offensive and destructive weapons—the strong arms and the hard beak—the cuttle-fish has also a valuable means of defence. It too has its enemies; for in the economy of nature, one race of animals serves as prey to another, or earth and sea would not be large enough to contain them. The grampus and the cachelot lie in wait for it, and the fishermen entrap the cuttle-fishes for bait, and for purposes of commerce. When attacked, this animal can throw out an inky substance, which darkens the water around, and in its cloud it eludes its pursuers; but this very ink forms the pigment called sepia, which is so valuable to painters in water colours, and thus becomes an additional cause of its being sought. This is a very thick brownish-coloured substance. Cuvier made his drawings of the cuttle-fish from the sepia procured by himself from the animal. Even the contents of the ink-bag of fossil cuttle-fishes retain their colour and properties; and Dr. Buckland has drawings of species now extinct, executed with the colour taken from the remains of these once living animals. Our cuttle-fish yields as good a pigment as the foreign kind; yet our sepia is generally prepared from a species found in the Indian seas.

That singular cluster, so like a bunch of grapes, and commonly called by the fishermen Sea-grapes, is a group of the eggs of the common cuttle-fish. We often find it on the shore attached to some of the larger sea-weeds; and if, during the summer months, we look into the baskets of shells and sponges, and other marine curiosities, carried by boys for sale, we shall often see it. The colour is a dark purple, like that of the grape, and the outer covering of the egg is flexible and tough, like In-

dian rubber. No sooner does the young cuttle-fish emerge from the egg, than it darts hither and thither, with the greatest rapidity; and if we only stir the water, by putting the finger into it, it immediately pours forth its ink in a cloud about it.

The common Calamary or Sea-pen of our shores

(*Loligo vulgaris*) is a very frequent object of the sea-side. Our engraving represents this animal as lying on a stone, while opposite to it are the glaring eyes of the poulpe. The sea-pen has a longer and narrower body than the common cuttle-fish, and is so called from the slender form of its transparent internal support. The animal

is naturally of a green colour, but can change itself to a dull brown hue. It is so rapid in its flight, that it is often compared to a flying-fish; while an allied species has received the name of Sagitta from its arrow-like movements. Our common pen-fish is called by fishermen the sleeve, or hoe-fish, and is a valuable article for bait. It is said that one half of the cod of Newfoundland is caught by its use. On those chilly shores it is found in abundance in the early part of the month of August. The Capelin—the fish which is used for bait when this is not in season—is at this time not to be found, so that the two kinds of bait alternately serve as a supply to the fishermen. Hundreds of tons of these animals are thrown up during the stormy weather on the flat beaches, where they lie in a decomposing mass, emitting an insufferable effluvium, and the cod is considered to be in the best condition when it has fed upon it.

The beautiful Nautilus, or Argonaut, belongs to the Cephalod tribe, though its shell is not internal, but forms for it a light and elegant dwelling.

CHAPTER IV.

ZOOPHYTES.

"Elongated like worms they writhed and shrunk
Their tortuous bodies to grotesque dimensions;
Compress'd like wedges, radiated like stars,
Branching like sea-weed, whirl'd in dazzling rings,
Subtle and variable as flickering flames,
Sight could not trace their evanescent changes,
Nor comprehend their motions, till minute
And curious observation caught the clue
To this live labyrinth—where every one
By instinct taught, performed its little task;
To build its dwelling and its sepulchre,
From its own essence exquisitely modelled;
There breed and die, and leave a progeny,
Still multiplied beyond the reach of numbers."

MONTGOMERY.

FEW who have read the records of travels made by intelligent naturalists in the warmer latitudes of the world, are quite unacquainted with the nature and labours of zoophytes. We read of tree-like fabrics, interweaving their branches, and presenting the exact image of a stony forest far down in the depths where the fan-coral waves in the clear blue sea; and isles and even continents are gradually formed by the united labours of myriads of tiny architects. There the coral rock or reef rises to the surface of the waters, till the sea throws up its mud and sand, and forms a level; or till some volcanic action brings it up to light and to man; and the island of the ocean is clothed with verdure and beauty, and the succulent plant, whose seeds were borne thither by ocean winds, prepares

a soil for the brilliant flower and the stately palm tree, and soon thousands of living creatures are creeping among its verdure; and as the winds play amid the boughs, they stir the plumage, and awake to song, the birds which have made them their dwelling-place. Man comes and finds a home of beauty, and among its lights and shadows dwells on the coral isle, nor dreams that he owes it to the humble architects whose labours were directed by the will and guidance of the Great Creator.

"The turf looks green where the breakers roll'd,
O'er the whirlpool ripens the rind of gold;
The sea-snatch'd isle is the home of men,
And mountains exult where the wave hath been."

There are many, however, who are not aware that on our own shores, delicate and beautiful zoophytes, many of them like plants, are brought up by the waves to their feet continually, and are lying almost on every beech, or grow among our rocks, or creep by entangling fibres or sand-coloured patches, over our sea-weeds, or are dredged up by the fishermen in multitudes. It is true, that the corals of the British coast are few and inconsiderable, but the skeleton of zoophytes from which the polypes which made them have died away, are among its commonest objects; and picked up often, and looking like plants, they puzzle the inexperienced marine botanist, who wonders that he cannot find their description in his work on sea-weeds. Nor is it much more than a century since, that men of science thought these zoophytes were vegetables, and led by their plant-like appearance, their fixed place of growth, the discs or tubular fibres which constitute their

point of attachment, they hesitated not to describe them as sea-weeds or mosses. They could discover in their leaf-like expansions, in their graceful sprays, no similarity to any living creature yet known as the resident of earth or air, or of the deep waters; and they had not as yet unfolded that page of Nature's book, which, after a series of patient and diligent investigation, has revealed to modern observers a new world of wonders, a new lesson of Almighty skill and design, as indicative to the thoughtful mind of the work of God, and as sublime in its influence over our spirits as are the teachings of the stars and suns of the lofty skies.

In the few pages to which we must limit our remarks, little can be done beyond describing some few of the commonest zoophytes of our shores, and naming such facts respecting them as may awaken an interest in the subject, and lead the reader to seek for further information. The zoophytes are well described as plant-like animals, the greater number of them being also compound animals. Thus when we speak of a zoophyte, we usually include the stony, or horny, or membranous fabric or case, and the polypes, the little living creature which dwells in these structures, which make them, and are indeed a part of them. In these skeletons or polypidoms, it may be that thousands of individuals exist, all united by a living thread, running through every part, and constituting a common circulation. Different individuals are they, and yet the same; their feelings, their interests, and labours, all under the influence of one harmonious instinct; and yet each flower-like polype having so far independent consciousness,

as to shrink if touched, while the other polypes seem quite unaffected by the movement, and fearless of harm. It is these cases, or polypidoms, which so often attract us on the beach or sands, where they lie; blown about by every wind, or finding a resting-place in some hollow among the stones. Beautiful horn-coloured sprays, like little fir-trees, or resembling brittle withered leaves, or forming crusts on sea-weeds, we see them every day in our summer rambles on the shore, and perhaps admire their graceful forms, and see how they are adapted to bend before the wave; but when we behold them through the microscope, and discover their wondrous living inmates, their active star-like polypes, all instinct with life and vigour; their beautiful cup-like, or bell-shaped, cells; their vesicles, now resembling a pomegranate flower, now shaped like some antique model of a vase, we feel how much there is of beauty lying unperceived by us even in common things, and bow in humble reverence before the Almighty Maker, to whom the little and the great seem alike deserving of his wondrous skill, alike the objects of his constant care.

Interesting as are the permanent fabrics of the zoophytes, the sea-fans, of far distant seas, the corals of commerce, or the white stony mushroom-like corals which greet us in museums; and elegant as are the horny branches on our sands, yet the little polypes, unseen by the naked eye, are no less beautiful, and present a far more wondrous structure than the skeletons themselves. Let us gather up from the beach one of those horny sprays, which the wind blows hither and thither, and place it under a good microscope, and down the

side of every branch, or in some species on both sides, we see a number of little horny cups, some close to the branch, others raised on stalks, and constituting, it may be, some hundreds or even thousands of cells. If our specimen is fresh and living, we may see, at the opening of these cups, the tentacles of the active polypes, arranged like rays around the centre, looking like so many daisies or other rayed blossoms, and, in fact, forming so many mouths and stomachs to feed one common body, placed within the horny spray, and each retiring, if alarmed, within its own cell. Every little thread-like branch, and every stem, is hollow; and the pink fleshy substance of the zoophyte, like a mere thread, may be seen filling up every part, and this is the living portion to which so many mouths are furnishing the needful food, when moving their active feelers about in the water, they catch the living prey which every drop of ocean contains.

If we gather up our specimen in spring-time we may in some species, easily, with the naked eye, discover a number of clear little vesicles, which look like seed-vessels; and are quite distinct from the cells in which the polypes reside. These contain the germ of the polypes, and from these proceed new structures; each horny fabric originating in a single polype. When viewed beneath a microscope, even these minute objects are found to be most beautifully varied; each species having vesicles of a form peculiar to itself. Thus in one common coralline we find them ovate or pear-shaped; in another they resemble an oblong pouch, marked with numerous and crested ribs. One species has vesicles reminding us of a swollen pod,

girded round with from five to nine bands, and rising into short spines; another has them covered over, at top, with a rounded lid. The germs within these vesicles, or seed-vessels, are seen by the aid of the microscope to be very small granules, their surfaces covered with minute hairs (ciliæ), and actively floating within these vases. They are extremely irritable, and if they come in contact with a hair, a grain of sand, or other small substance, they are capable of contracting their bodies into various forms. They whirl about in constant motion, until they select some point of attachment, where they fix themselves, and thence, in course of time, arises the goodly spray which delights our eye.

Zoologists arrange the zoophytes into two large classes; the Anthozoa, which have symmetrical bodies, capable in every part of contraction, with a single aperture for food; and the Polyzoa, sometimes called Bryozoa, whose bodies are unsymmetrical, and incapable of contraction. The Anthozoa contain the larger animals; but those forming the polyzoa, have the more perfect organization, and are in a higher scale of animal life.

A few common examples of the first class, to be described, will, by the aid of our engravings, be at once recognised by every one accustomed to the shores of our island, as objects long familiar.

A very frequent and pretty zoophyte, is that called the Small Coryne (*Coryne pusilla*), which may be found on old shells, or on stones or seaweeds, between the tide marks. It differs as to size, but is not often more than an inch in height, adhering to the shell or other substance on which it grows, by means of a fibre, which creeps over it.

With this fibre the zoophyte commences, and an erect stem rises, from which shoot branches in all directions, each terminated with a little fleshy shining red knob or head, on which are a number of short thick tentacula or arms, which are very vigorous, ever moving up and down to catch such prey as comes within their reach; and each tipped with a little globular end. These are the polypes; the mouths of the fleshy living thread which runs through every portion of the zoophyte. The tentacula, though always moving, yet do so very slowly; and it is most interesting to watch the gradual motions of this little creature. It may be preserved for some time in salt water, if the liquid be frequently changed. The stem of this coryne is horny, tubular, somewhat clear, wrinkled and ringed. Occasionally this zoophyte is parasitic on other species. When growing on another coralline, the Tubularia, it sometimes gathers all about the stalks, covering them with little horny threads, not thicker than such as are used for sewing. It is also itself sometimes covered with small parasitic sea-weeds, composed of slender threads; so that, Dr. Johnston remarks of it, that he has seen specimens so completely overrun with this, that they appeared, under the microscope, nearly as mossy and glandulous as the stalks of the moss-rose. Our figure represents the coralline in its natural size.

There is a genus of zoophytes called Tubularia, from the tubular-like pipes of which they are composed. The fibres of this family are all hollow and erect, and a soft pulp runs through them; while

at the extremity the fleshy polypes, surrounded with their thread-like arms, protrude like a starry flower. Our figure describes the Tubular Coralline (*Tubularia indivisa*), a very common zoophyte on shells and stones, from deep water; and it may often be found entangled among sea-weeds, cast up by the waves on the beach. Many who are accustomed to pick up sea-weeds, and other marine objects, are perplexed by this zoophyte, as it seems a bundle of fibres, which, at first appearance, resemble a root torn from some sea-plant. On closely examining it, however, even without a microscope, the hollow pipe-like nature is clearly evident. Ellis compared it to oaten straws with the joints cut off; and except that the diameter of the tubes is often smaller, this well describes it. In fine specimens they are quite as large as an oaten straw, but more commonly they are not larger than the stalk of a primrose. These tubes are of the colour and texture of thin horn, sometimes divided at the base, and twisted into serpent-like forms; and they are occasionally ten or twelve inches high. A reddish pink pulp, which unites all this singular family of polypes into one animal, runs through the tubes, from the open ends of which issue the polypes. A scarlet knob, forming itself above into a kind of proboscis, is surrounded by a number of short scarlet tentacula; and at the base of

the body, is another circle of much longer ones, and thirty or forty in number. None of our common zoophytes are better for examination, when picked up from the shore, than this. In scarcely any of the others, unless brought up by the dredge, and carried home immediately to be placed in salt water, can we discern the living wonders. A few hours on the beach will usually deprive them of life. But this coralline, if placed in a tumbler of water, will often, some hours after, exhibit its living flowers in full vigour; and he must indeed be indifferent to grace and beauty, who could look upon them without interest. After being thus kept for some time in the house, its decline is apparent; and the starry head drops, as would the daisy flower, if some ill wind snapped it from its stem. Let but an interval of a week or more pass over it, however, and again a new head appears, though in a less perfect condition than the original one. The stem is always lengthened by the new formation; and numerous heads may also be produced by cutting the tubes into several pieces. Thus twenty-two heads were derived, in the course of five hundred and fifty days, from the sections of a single stem. A species of Tubularia (*Tubularia dumortierii*), growing not in clusters, but in unbranched solitary tubes of horny colour, and unwrinkled and narrowed at the base, seems somewhat like the last-named species in miniature, but it is not common. There are, besides, two other species of the genus, and the engraving will sufficiently convey an idea of the general appearance of the whole, to lead to their recognition as members of this family. The graceful Tubularia (*Tubularia gracilis*), is often

parasitic in tufts upon our common Tubular Coralline. A beautiful species of the Indian seas (*Tubipora musica*), resembles a cluster of organ-pipes, with several transverse floors or stages running through it. The pipes are of a rich red colour, and the polypes of loveliest crimson hue, with arms of bright green.

There is a curious British zoophyte belonging to the Tubulariadæ, which, though not frequent, demands notice from its great beauty. The Corymorpha nutans is about four and a half inches long, and its stem about half an inch in diameter. When young, part of its stem is enclosed in a thin horny tube, which afterwards disappears: it grows rooted in the sand, and has a clear white stem, delicately tinged with pink, and pinkish brown lines running down it. A head terminating in a pink trunk, and surrounded by tentacles of pure white tint, above which are placed numerous orange-coloured processes, completes this beautiful animal. Forbes and Goodsir thus describe an individual which they found in the Bay of Stromness, Orkney: "When placed in a vessel of sea-water, it presented the appearance of a beautiful flower. Its head gracefully nodded, bending the upper part of its stem. It waved its long tentacula to and fro at pleasure, but seemed to have no power of contracting them. It could not be regarded by any means as an apathetic animal, and its beauty excited the admiration of all who saw it."

But turning from this rarer beauty, to some common species, known to all familiar with the sea-side, we proceed to the family of Sertularia, many species of which are generally taken for sea-weeds. Our engraving will enable the reader to

identify one of the most frequent, the common Sea-fir(*Sertularia abietina*); its elegant sprays clus-

tering often upon shells and stones, or snapped off by wind or wave and thrown upon the shore, has met the eye of every rambler there, who observes the objects around him. It grows upon any kind of shell, and it is seldom that oysters can be dredged up from the sea, without having some of their number adorned with this graceful coralline. It rises upright like a little fir-tree, or it resembles

a branch of the plume-like brake of our woods and heaths in shape, and tiny shells often hang about its branches. It is of a horn colour, becoming more clear and transparent in drying, and placed in the herbarium it seems like a branch made of amber. It varies in height from four to twelve inches. The stem is slightly zigzag, and sometimes the branches have other branches on them. Even when seen under a common magnifying glass, such as naturalists usually have about them, we can discover in the little teeth which are adown the branches, a minute aperture, which is the opening of the polype cells, the little tube or flask-shaped dwellings of the animals. In the winter time the little vesicles or bladders containing the germs, are thickly scattered over the branches. Sometimes the sea-fir is tinged with a red hue, which in some cases remains on the shining stems of the dried specimens. Other species of Sertularia are also occasionally tinged with this hue, though the cause of this peculiarity is undiscovered.

A MAGNIFIED BRANCH OF SEA-FIR.

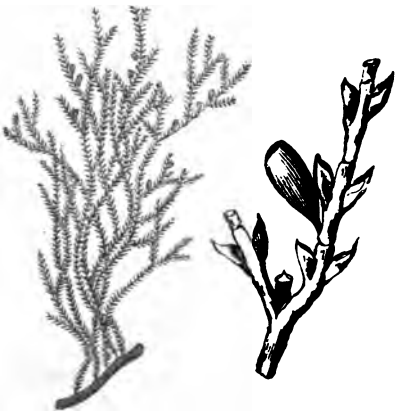
Very often, on examining the Knobbed, or Serrated, or Bladder Fucus, we find growing on its frond the horny shoots, scarcely larger than a sewing thread, of the zoophyte called the Sea-oak Coralline (*Sertularia pumila*), which received its

familiar name from its frequency on the bladder fucus, known in old times by the name of Sea-oak. The shoots often cover a large portion of the sea-weed, originating from a slender hollow thread, which is a link between them all. This small coralline is very common, being sometimes found on other species of our marine plants. Few who look at this little horny thread, would think that it was the production and home of innumerable living flower-like polypes, each provided with fourteen arms, by means of which it can catch prey for the food of the community; and which, though low in the scale of animal organization, yet seems to have been created for active enjoyment.

Another delicate and elegant coralline, often found on old shells on the stems of Tangle, and also as a parasite on other zoophytes, is the Lily or Pomegranate-flowering Coralline (*Sertularia rosacea*). It is of a white or pale horn colour, very slender, and only one or two inches high. Its vesicles are most elegantly formed, and Ellis compared them to a lily or pomegranate flower just opening.

There is a pretty zoophyte, so common, that if our engraving or description convey a just idea of it, every one frequenting our shores will remember to have seen it, perhaps to have placed it among a collection of sea-weeds, or brought some of its delicate tufts home as an ornament for the mantel-piece. It has the same horny texture, the same plant-like appearance, as all the other species of this interesting family of zoophytes. The common Sea-hair (*Sertularia operculata*) grows in long tufts of fine horny threads, on several of the sea-weeds, but especially on the Digitate Tangle. It is sometimes even twelve inches high,

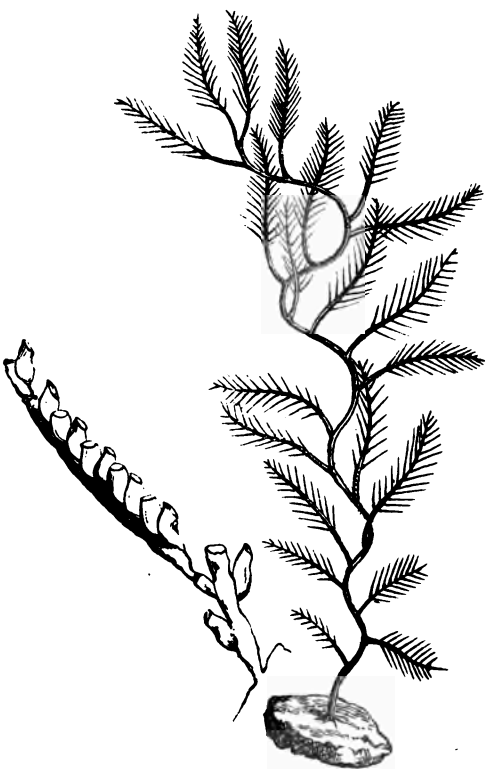
but more generally the tufts vary in height from four to five inches. Ellis remarks of it, "This very neat and most regularly formed coralline,



consists of long trailing branches, with very sharp teeth placed exactly opposite; each pair seems to be jointed into the next. The slender branches grow in tufts like branches of hair." Sometimes, when of a pale horn colour, and dripping with the sea-water, it looks almost like tufts of silver thread. There is a little cover or lid to the vesicles of this species, and hence its scientific name, from *operculum*, a lid. In summer time the tufts are covered with these little clear vesicles. Our figure represents them both in their natural size and magnified appearance. The sea-hair is generally placed among our finer sea-weeds, in those little landscapes sold in the shops in sea-coast towns.

An elegant zoophyte on shells in deep water, called the Bottle-brush Coralline (*Thuiaria Thuia*), is so like that domestic implement that it received

its name from the fishermen on the northern coast of England. It is common there, particularly about Scarborough. Another is called Squirrel's Tail (*Sertularia argentea*), because it is so like the tail of our woodland animal; but as neither of these is a very general coralline, we will proceed to one well known to every one at all used to sea-side productions. This is an elegant species



familiarly known by the name of Sickle-beard (*Plumularia falcata*). It is common every where, on shells and stones, or often torn from its native spot of growth, lies about the shore, becoming the sport of every wind and wave, when we may find it lying with its stems twisted into diffuse and distant coils, like a lady's ringlet. On a slender spiral stem, usually about four or five inches high, though in extraordinary specimens attaining the height of twelve inches, are feathery branches with little branchlets, about as thick as a common needle, and a quarter of its length. The cells which contain the polypes are not on the main stems, but on the branches and branchlets, where they are placed down the side in rows of little teeth, which bend inward like a sickle. Our engraving represents them in their magnified condition, and the coralline in its natural size.

The Podded Coralline (*Plumularia cristata*), though not so general as the sickle-beard, yet is not an uncommon object on our sea-side stones and shells. It is found too sometimes on sea-weeds, especially on that common one, the podded halidrys. It has an erect instead of a spiral stem, and is usually smaller than the last-named kind, and being generally of a deeper yellow colour it is much prettier. Ellis compares the polype cells to the flowers of the lily of the valley, and they are indeed like our favourite spring flower, being shaped like bells, with the rim cut into about eight equal segments, while in front there is a strong spiny process, which does not project beyond the cell. The vesicles, or little bladders, plainly seen in this coralline with the naked eye, are described by Dr. Johnston, when seen under

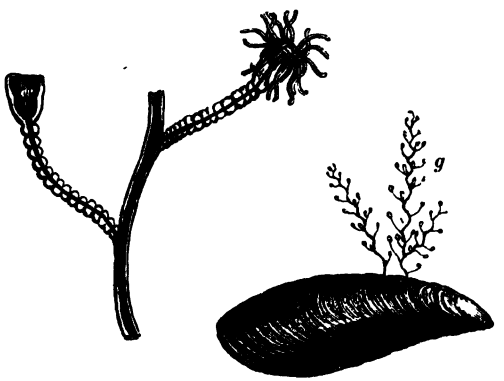
a magnifying glass, as resembling a swollen pod girded round with from five to nine cristated ribs or bands. A quotation given also by that valuable writer from another, will here show how deeply interesting are these little common productions of our seas, to those who have carefully examined them. "Each plume," says Mr. Lister, in reference to a specimen of the podded coralline, "might comprise from 400 to 500 polypi, and a specimen of no unusual size, before me, has twelve plumes, with certainly not fewer cells on each than the larger number mentioned: thus giving 6,000 polypes as the tenantry of a single polypidom. Now many such specimens, all united too by a common fibre, and all the offshoots of one common parent, are often located on one sea-weed, the site then of a population, which nor London nor Pekin can rival. But Plumularia cristata is a small species, and there are single specimens of Plumularia falcata, or Sertularia argentea, of which the family may consist of 80,000, or 100,000 individuals!" Surely if we could gain, here below, any idea of the infinite Creator, it would be when we consider wonders like these, and were it not that they are facts susceptible of actual demonstration, such statements would demand as great a degree of faith as even the sublime declarations of the mysteries of Revelation.

A very pretty coralline is common on the sea-weeds which grow near low-water mark. It is often parasitic on the fronds of the tangle, or podded halidrys, though not confined to them. Sometimes its tiny knotted roots creep about the broad tangle leaves, like a regular piece of network, and, as Mr. W. Thompson has remarked,

"the meshes are of different sizes, with their junctions tied in a knot as it were by fairy fingers." From each knot, in due time, springs the knotted thread coralline (*Laomedea geniculata*). This zoophyte is about an inch in height, very little branched, and sometimes not at all so, of a very clear white colour, now and then tinted with red. Minute as is this animal, it presents under the microscope an exceeding beauty. Its polypes may be seen, in a fresh specimen, protruding like so many daisy flowers, and in summer time when the vesicles are plentifully scattered about, we see objects which appear like antique vases, sculptured into most graceful and elegant form. This coralline is often found on the common grass-wrack of our shores.

Almost as common as this, is the Gelatinous Laomedea (*Laomedea gelatinosa*), one of our most elegant zoophytes. Our figure represents part of a specimen about eight inches long, which was picked up on the beach at Dovor, but it is seldom

more than three or four inches long, with a stem about as thick as small twine. Figure *g* describes, however, the more common appearance of this zoophyte. "It occurs thus," says Dr. Johnston,



"in Berwick Bay, growing gregariously on the sides and under surfaces of stones, lying in shallow pools between tide marks, and seemingly giving a preference to shores that contain an impure and brackish water. The shoots are all connected with one another by the radicle fibre which creeps in an irregular manner on the rock, rarely above an inch in height, simple or sparingly branched, consisting of a single tube of a light horny colour, ringed above the origin of the long twisted thread-like stalks on which the polype cells are raised." The vesicles are urn-shaped.

Both the species of Laomedea are remarkable for the luminous properties which appear to be more or less exhibited by all the transparent

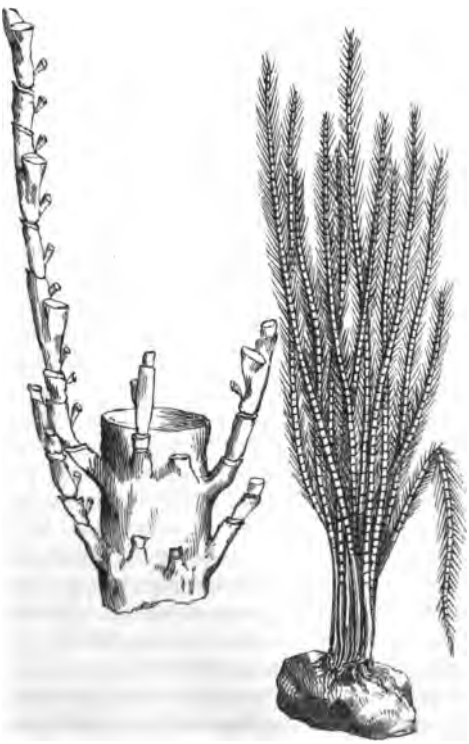
zoophytes. Dr. Johnston, as well as other writers, quotes Mr. Hassall's interesting remarks on this subject. Speaking of the phosphoric light emitted by corallines, Mr. Hassall remarks, "This fact I first discovered in a specimen of Laomedea gelatinosa, and subsequently in a great variety of other species. If a portion of it, adhering to the sea-weed to which it is attached, be taken from the water, and agitated, a great number of bright phosphorescent sparks will be emitted; these sparks proceed from each of the denticles of the coralline containing polype, and the phenomenon is equally apparent, whether the specimen be in or out of the water." In another work this writer adds, "I lately had an opportunity of beholding this novel and interesting sight of the phosphorescence of zoophytes, to great advantage, when on board one of the Devonshire trawling-boats which frequent this coast. The trawl was raised at midnight, and great quantities of corallines were entangled in the meshes of the network, all shining like myriads of the brightest diamonds." Mr. Hassall also states, that once each week he received from the master of a trawling vessel on the Dublin coast, a large hamper of zoophytes in the fresh state. In the evening these were taken into a darkened room, in which several persons were assembled to witness this beautiful exhibition. "I then," says this writer, "used to gather up with my hands as much of the contents of the hamper as I could manage, and tossing them about in all directions, thousands of little stars shone out brightly from the obscurity, exhibiting a spectacle, the beauty of which, to be appreciated, must be seen, and one which it has been the lot of but

few persons as yet to have looked upon. Entangled among the corallines were also minute luminous annelides, which added their tiny fires to the general exhibition." The light given out by the polypes seems caused by irritation.

There is a beautiful little coralline, called by Ellis the Small-climbing coralline, with bell-shaped cups (*Campanularia volubilis*), which creeps, like so many threads, over sea-weeds, and often also over other corallines, and which is well worth observation with the microscope. Its polype cells are graceful little bells, and so beautiful is its construction, that each little cup has, at its base, a delicate joint or hinge, which is thought to have been designed, by the great Creator, for the purpose of enabling this delicate and fragile creature to bend before the force of a wave, which else would dash it into atoms: but we must pass by this lovely little object to some more easily described, and which cannot fail to attract the notice of every passer-by.

The horny, hollow-jointed shoots of the Lobster's-horn coralline, or Sea-beard (*Antennularia antennina*), lie about in summer-time, upon every shore. They have been rent away from their place of growth on the stones which lie among the sea-sands, or perchance from the sands themselves, on which they often grow in erect clusters. The polypidoms of this species are straight shoots, growing together in a cluster of about a dozen in number, sometimes as much as seven or eight inches in height, of a clear yellow horn colour; and the fisherman knows them well, for they crowd upon the oyster-shells in profusion. The shoots are surrounded with hair-like branch-

lets, in numerous whorls, a whorl to each articulation. The number of these branchlets in each whorl varies from five to nine; and Mr.



Hassall has remarked, that in the same specimen, the number usually remains the same throughout. When magnified, these hair-like processes present the form of sickles, and bend in, towards the main

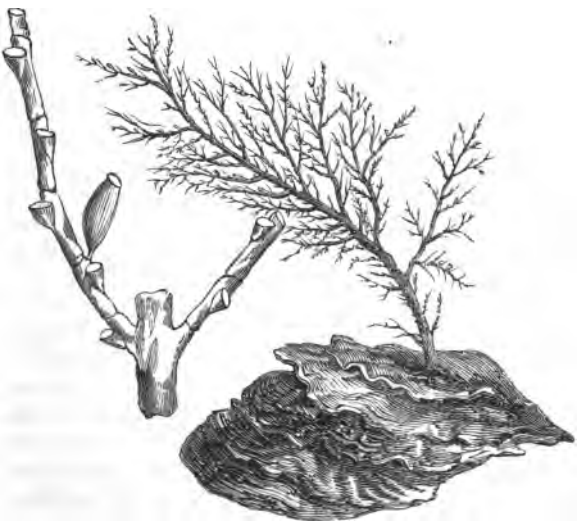
stem. The specimens which are found on the beach, after rough weather, are generally much broken, and their whorling branchlets often torn away; so that the zoophyte, in that condition, more nearly resembles the horns or antennæ of a lobster than when perfect.

The branched Antennularia (*Antennularia ramosa*) differs little from the foregoing species, except in the fact of its having branched instead of straight shoots. It is found on old shells and stones, in deep water; and most visitors of the sea-side have seen it lying about the shore. Some writers think the two species should be considered but one.

As Ellis has observed, the greatest variety of corallines are to be found on what are generally called rock oysters, or upon those beds of oysters for some time disused or neglected. In places like these, they sometimes cluster in such quantities as to look like little fairy groves. If we can procure them immediately after being dredged up, and, taking them carefully from the oysters, place them in dishes full of sea-water, they will soon recover from their temporary alarm, and we shall shortly see the polypes expanding their tentacula fearlessly, like living flowers. Observations are best made in summer, as in winter the animals become torpid and contracted.

It would not be often that a dredge of oysters would come up, during the summer season, without having, on some of the shells, that pretty and common species, the Herring-bone coralline (*Halecium halecinum*) which grows on stones and shells, in the deep parts of the sea. The young zoophyte is of a deep yellow hue; but it soon

loses this brighter tint, and as it increases in size, it assumes a dingy brownish colour, like that of wet sand. It is very brittle, and irregularly



branched, and from four to ten inches in height, growing upright from numerous fibres matted together like a piece of sponge.

A large number of these pretty plant-like zoophytes must be left unnoticed here; nor shall we linger long over the division of the large class Anthozoa, called the Asteroida. Zoophytes of this order consist of a calcareous or horny axis, or internal skeleton, surrounded by the fleshy parts of the compound body. Our British species are all natives of the deeper parts of the sea, and cannot, therefore, be considered as common ob-

jects of our shores; though several of them are well known to our fishermen, and also to the inhabitants of sea-side towns, from being frequently brought up in the dredge. It is in this division that we find those beautiful sea-fans which most of us have seen among the curiosities brought home from the tropical seas, and which looking to us like so many stony sprays of sea-weed, yet convey little idea of their beauty in their native haunts. Waving about, under the emerald-green waters, like willow-trees before the wave, bending in most graceful attitudes, and coloured with brilliant hues of violet and purple, and paler blue, they may well attract the young voyager who stoops over the side of the vessel to look down into the deep; and we wonder not that he hastens to the coral reef, where they are waving, and returns with bleeding feet from their sharp ridges, rich with the spoils of the sea. Cuvier, in his "Theory of the Earth," describes the beauty of these lithophyta, which abound in the seas of the tropics, and are propagated with great rapidity, their tree-like forms being variously interwoven, and often forming frightful snares for navigators. We have four British species of these Sea-fans (*Gorgonia*), and one of them is common on the Devonshire coast; but they are far inferior in beauty of colour, as well as in size, to the natives of warmer latitudes. Our fishermen may well call them sea-shrubs, for few would look upon them without deeming them some plant, encrusted with lime. The sea-fan branches out into a complete network, the whole mass of which is organized and living, and receives its food and means of increase from the food abounding in

every drop of ocean, and gathered in for the support of the whole body, by the vigorous polypes, whose arms, expanded like flowers, convey the prey into their stomachs. Yet the axis of this sea-fan is not, as we might at first suppose, of a stony nature; it is horny, and covered with a fleshy substance or crust, the living link which unites the numerous polypes into one harmonious whole. As this crust dries, it becomes friable and porous; and it is in this state that we see it when we look at the sea-fan in the museum, or place it in our houses for ornament. Nor is the flat and fan-like shape of the zoophyte a mere accidental figure. The prevalence of this form in submarine vegetation long since attracted the attention of our great naturalist Ray, who, in his work on the "Wisdom of God in Creation," thus remarks on it:—"That the motion of the water descends to a good depth, I prove from those plants that grow deepest in the sea, because they all generally grow flat, in the manner of a fan, and not with branches on all sides, like trees, which is so contrived by the providence of nature, for that the edges of them do, in that posture, with most ease cut the water flowing to and fro; and should the flat side be objected to the stream, it would soon be turned edgewise, by the force of it, because in that site it doth least resist the motion of the water: whereas did the branches of these plants grow round, they would be thrown backward and forward every tide. Nay, not only the herbaceous and woody submarine plants, but also the lithophyta themselves, affect this manner of growing, as I have observed in various kinds of coral and pori."

Then there are, in our seas, the Sea-pens, shaped so much like our writing implements, that if our fishermen brought them up from the mud in which they are sticking, the reader would at once recognise them. There is but one British species known, and this the fishermen call the Cox-comb, for it has a broader expansion than some other kinds, and consequently has a less perfect resemblance than some others to the feathered part of a quill. The Phosphorescent Sea-pen (*Pennatula phosphorea*) is about three or four inches long, of a purplish red colour, tapering, and naked at the lower end, and feathered about half-way down, with closely set pinnæ. Here, along the margins, are placed the polype cells, and hence may be seen their clear white arms, eight in number, protruding themselves, in search of prey. The pinnæ are curved backwards, and move up and down, sometimes altogether, sometimes with separate motion, so that this zoophyte has been said by some zoologists to have the same oar-like motion as that given to fishes by their fins. This lovely object is remarkably phosphorescent, as are all the species of *Pennutalidæ*. It appears to be luminous when it chooses, and apparently only emits its light when under some irritation. Dr. Johnston calls the zoophytes "Will-o'-the-wisps of the sea, put out to frighten feeble assailants." When plunged in fresh water, this beautiful sea-pen scatters sparks in all directions.

The *Virgularia*, which the fishermen call Sea-rush (*Virgularia mirabilis*), is a less frequent marine production, but is found on the eastern and north-eastern shores of Scotland, as well as on some other parts of our coasts. It varies in length

from six to ten inches, and is like a quill, stripped of its feathers.

But quitting rarer for familiar objects, we must proceed to that common zoophyte of our coast, familiarly called Dead Men's fingers, or Dead Men's toes, because it is sometimes found divided into lobes somewhat resembling those parts of the human frame. The *Alcyonium digitatum* is very often a shapeless mass, and sometimes a mere crust on an oyster shell. It is of a deep orange-colour, with a tough, leathery skin, filled inside with a jelly-like substance. Its first appearance is rather uninviting, the more especially, as, even in its fresh state, its odour is most disgusting; yet if we take it home, and place it in a tumbler of sea-water, we shall soon become not only reconciled to it, but filled with admiration at its beauty. Gradually, the mass imbibes the fluid, and swells to a larger size; and, looking down closely upon it, we find its surface thickly scattered over with starry figures, divided into eight rays, from which emerge the eight tentacles of each polype, all moving about with great activity, and forming a most beautiful assemblage of animal-flowers, arranged round a

clear cylindrical tube or column. This zoophyte may be found on almost any part of our coasts, adhering to stones or shells brought up from deep water, and in some places is so common, that if a dredge of oysters were to be brought up from the deep, not a shell or stone but would exhibit one or more of the conspicuous tufts of this interesting zoophyte.

Perhaps the zoophytes best known as such to visitors at the coast, are the beautiful Sea Anemones, which offer their loveliness to every eye, and need no microscope to reveal their tints or forms. Clustered by thousands on sea-side rocks or sands, adorning the sides of rocky pools, with flowers which resemble marigolds or China-asters

in their form, but which are brighter in their colours than any flowers which our garden can show; redder than roses, of richer purple than the violet, and wearing the rainbow hues of the gorgeous cactus flower, which the painter in vain essays to

copy, there are few objects in nature more calculated to attract our notice than are these living flowers. There they grow—

"Rooted and slumb'ring through a dream of life,"

making a little isle of beauty of the rock where they abound, waiting, with the dark, lank sea-weeds, the return of the tide; and perchance awaking in the mind of many a poet such thoughts as arose in that of Southey, when he described them, in his poem of "Thalaba:"—

"Meantime, with fuller reach and stronger swell,
Wave after wave advanced:
Each following billow lifted the last foam
That trembled on the sand with rainbow hues;
The living flower, that, rooted to the rock,
Late from the thinner element,
Shrunk down within its purple stem to sleep,
Now feels the water, and again
Awakening, blossoms out
All its green anther-neck."

We may find these sea anemones on almost all parts of our coast; but we must not go out to look for them when the shades of evening are soon about to gather over the ocean, or when the bright moon is silvering over the waters. They delight in sunshine; and their clear white, or orange, or scarlet, or pink arms, moving about to catch the food within their reach, can be seen only under the cloudless sky. Beautiful as they are beneath our summer noon, yet they cannot compare with the species peculiar to those warmer latitudes, in which every tint brightens into more glowing hues. When in a state of repose, the sea anenomes lose all that is attractive in their appearance. They assume the form of a wrinkled

fleshy cone, or they lengthen themselves into a flabby cylinder, with only a small aperture at the summit. The surface of the cone is in some cases smooth, in others covered over with little bead-like prominences. Sometimes it is glossy, like silk, or it may be covered, as with a coat of velvet. Some of these animals encase themselves with bits of broken sand or gravel, or other things within their reach, making for themselves a coat of mail, to compensate for the want of that protection which is given to some polypes by their horny or calcareous polypidoms. It is not easy to detach them from the rock without injury; but, by inserting the blade of a knife carefully under them, we may unloose them from their hold, and bring them away, and long preserve them. By the next day they will have recovered from the shock, and in the dish of salt water we may see their numerous tentacula, surrounding the central disc in clear and lustrous beauty. By changing the water frequently, they will live for many months in-doors, though, after a time, we perceive that they become more languid. Sometimes we may see these large polypes, these sea-anemones, drawing in water through their tentacles, until they become wonderfully distended, and their rays are thus rendered more clear and beautiful and plump by imbibing the water. Sometimes our sea-anemone becomes so distended as to lose all its symmetry, and the stomach lies like a clear bladder over the sides of its circular form, in large lobes. After a while, the water thus imbibed is projected in jets, or in a stream, from several of the tentacula; and Dr. Johnston remarks, that if the contraction is sudden and strong, the water

may be thrown out with so much force as to rise to the height of at least a foot.

To look down upon these flowers, one would deem them the most helpless of living creatures. The water, with its myriads of tiny insects, seems to afford their proper nutriment, and none would guess, to glance at them, that they could possibly kill, and swallow crabs and shell-fish larger than themselves. But the great Creator, when he made them, furnished them all, helpless as they seem, with the means of securing their appropriate nutriment. They possess a poisonous secretion which soon extinguishes life in the animal which comes near them, and which can make us conscious of its power to sting. This poison is not of equal strength in all the species; in some, it is sufficient to cause only a slight sensation of tingling in the fingers which have touched the anemone; in others, the sensation is more of a smarting or burning nature. It appears, too, that different persons are variously affected, even by touching the same individual. The author had placed in a vessel of sea water, a fine specimen of the Fig Marigold Sea Anemone (*Actinia mesembryanthemum*), which she was accustomed to touch many times during the day. The tentacula closed immediately around the intruding finger, producing only a slight tingling. Her surprise was great at finding that the same anemone, on being touched by another person, communicated a more powerful sensation, which her friend assured her was felt up the whole of the arm. More than twenty persons touched this anemone, and the writer was amused by observing how variously they were affected; some being only slightly tingled, while others started back as

if stung by a nettle. The poison has a great effect on the inferior animals. Woe to the crab or the lobster which strays near the innocent looking animal-flower: strong and active as he seems, he has little chance of escape. Slowly, and with apparent caution, the zoophyte seizes his prey, and crowding around all his brilliant petal-like arms, drags it into his stomach. He is swallowed whole; and so much of him as can be converted by the animal into nutriment, digests there; while again the anemone turns out of its mouth the shell, or harder and indigestible portion of his victim. Mr. Cocks remarks of one British species (*Anthea cereus*), "The fish which has been so unfortunate as to be embraced by the tentacula of this anemone for a few minutes, loses its activity, becomes stupid, the eyes injected, and death soon closes the scene. In August, 1845, I removed from the stomach of an individual, a partly digested fish, nearly four inches in length; and I have frequently taken from the stomachs of others, crabs, two and a quarter inches in diameter." Another writer once remarked one of those mistakes in instinct, which animals sometimes exhibit, in the case of our most sagacious little insect, the bee. It hovered over the anemone, which was just then only covered by a rim of water, and evidently mistaking it for some gay marigold or other blossom, the luckless insect darted through the water to the mouth of the polype. It struggled to get free for some time, but was held down till being drowned, it was swallowed. Hungry creatures, too, are these anemones. A little bee would not serve one of them for his dinner, for delicate and frail as they seem, three or four mussels are only

sufficient for a single meal, and they are all dissolved before the anemone casts forth the useless shell.

Dicquemare, by changing the sea-water of the vessel in which they were held, kept sea anemones for some years, and tried numerous experiments with them. He says that they foretell changes of weather as surely as the barometer. Even when kept within doors, they are sensible of atmospheric changes long before these are evident to our less acute sensibilities; and that great naturalist thinks that they might be kept in sea water, daily renewed, and might serve the mariner as a sea barometer.

The Actiniæ are not easily injured. They possess, in common with other creatures low in the scale of animal organization, a great tenacity of life, and a wonderful power of renewing any mutilated portion. They may be immersed in hot water, or frozen; their arms may be cut off, their very bodies cut into two or more pieces, yet, give them time, and again we find them forming into a circular body, and little arms growing out afresh on the portion from which they had been severed; while the rays, in the course of a few weeks, again form themselves into a living flower. Eyes they have none, and yet not a cloud can pass over the blue sky on a summer's day—a cloud which would hardly warn the scarlet pimpernel to close against coming rain—but the anemone shrinks as if injured; and so sensitive is it to the presence of fresh water, that a plunge of only a few minutes destroys it. Rooted as they are to the rock, yet they can, at will, unfasten themselves from their attachments, and creep about over its surface,

experiencing, doubtless, a sense of enjoyment, when, in their rapacity, they devour their prey. The Actiniæ all grow singly, but the allied family of Zoanthus, consists of a number of small animal flowers, seated upon one fleshy base, and connected together by it.

The bodies of our British sea anemones are, in some, of a deep scarlet tint; in others, of green hue, like the young spring leaf; or of dull olive green, or of the pale hue of the green sea. Some are liver coloured or of dark claret, or of all shades of red or buff; and for whiteness, some of them rival the snow itself. One of the commonest species is the Fig Marigold Sea Anemone (*Actinia mesembryanthemum*), which may be found on almost any of the shores of our island, where clustering rocks or stones can afford it a habitation. The older French writers called it *La plus petite des orties de mer;* and a nettle it is in its stinging powers, but they are not so pungent as in some other species, though some writers still call it the small red sea-nettle. Its body is, when fully grown, about an inch or an inch and a half in diameter, forming a half globe in shape. It is of dull liver colour or olive green, sometimes marked with blue and greenish lines. The base which surrounds the hemisphere like a ruffle, has sometimes, though not always, a bright blue rim around its edge, and it is occasionally streaked with red. The arms are long, and usually of the same colour as the body, but paler and clearer in tint. Around the central aperture, and just within its margin, are twenty-five little blue tubercles, which resemble so many turquoise beads. This species expands only when covered with water.

Another frequent species, and one which adorns the rocks and reefs about our southern shores, and makes them like a blooming garden, is the lovely tinted Purple Sea Anemone (*Actinia crassicornis*). Not that it always exhibits the colour which gives it its familiar name, for it varies much in hue. In one of its varieties it is of brilliant scarlet, studded with spots of a paler colour. Now we see it revelling in the subdued sunshine, enjoying its warmth, yet screening itself from its glare in the crevice of the rock or under the shelter of some large stone, and we pause to admire its delicate cream tint or its sulphur-coloured beauty. A little further on, and our sea anemone displays itself in greenish hue, with orange stripes; or marbled with red and white, would lead the inexperienced naturalist to believe that he has found some other species. The tentacula are very often, indeed almost always, marked with white and red rings; but sometimes, when the body of this actinia is of a pale flesh or cream colour, there are no rings on the tentacula, but they are of the same hue as the body. The body in this species is rough, with minute glandular excrescences.

To look at the sea anemones when they are closed, or to put our finger on their cold slimy coats, one would not be very ready to suggest the proposal of making a meal of them, yet in tropical countries they are much used as food, and a beautiful species, with crimson tentacles, which is abundant on the shores of the Mediterranean, is a favourite dish of Italian epicures. Our common Purple Sea Anemone (*Actinia crassicornis*) is said, by the Abbé Dicquemare, to be preferable to any other for the table. "Being boiled in sea-water,"

says this writer of these polypes, "they acquire a firm and palatable consistence, and then may be eaten with any kind of sauce. They are of an inviting appearance, of a light shivering texture, and of a soft white, and reddish hue. Their smell is not unlike that of a warm crab or lobster." After all, they would not, to any of us, be more uninviting than a dish of snails, yet to the Hungarians this is agreeable, as it was to the ancient Romans; and delicate ladies dine on snails, cut into small pieces and dressed with seasoning, while they would shudder at the sight of a raw oyster.

Twenty different kinds of sea anemone are found on our coast, some of them much larger than the common species which we have described.

Passing by many interesting zoophytes to proceed to the other large class, the Polyzoa or Bryozoa, often called the moss corals, we find there a very different structure of the animals, though much resemblance in the skeletons. The Polyzoa, though smaller than the Anthozoa, are of higher organization. In the compound anthozoa, as in the sea fir and sickle beard, the polypes seem each to be a bud issuing from a common fleshy trunk; but, in the polyzoa, every individual is distinct, though they are all connected by one common bond of union. Dr. Johnston's comparison of the former to a "chain, of which all the links are welded; and the latter, to a necklace where the beads are strung together by a common thread," presents us with a good idea of the distinction. In the anthozoa, the horny plant-like fabric, or the stony substance of the coral, has little or no organic connection with the fleshy portion; for although it originates in the polypes, and

is secreted by them, yet, when once formed, it has no further power of development, nor is any circulation carried through it. But in the moss corals, the outward skin, the polypidom, continues to be always a living part of the animal which dwells within; it adheres closely to the polype, and is connected with its flesh. None of the animals of this class are separate or naked, like the sea anemones; they all grow in compound bodies, and are lodged in cells, in which, during a state of repose, the polypes lie doubled up. The species of moss corals are very numerous. Hundreds of fossil kinds, undiscovered but by the aid of most powerful microscopes, have recently been detected by Ehrenberg and D'Orbigny, their shelly coverings entering into the composition of chalk beds, mountain limestone, and the flints of the Jura limestone, sea sands, and the sands of the Libyan desert. Many of these are altogether invisible to the unassisted eye; others appear like minute points, smaller than the grains of the sandy shore. So minute are some of the species of moss corals, that great accumulations of them are found in the finest prepared whiting, uninjured in form, amid all the processes of its preparation. And when we call in the aid of the microscope we may behold them, of exquisite symmetry, in the chalk coating which covers the walls of our apartments, forming there a beautiful mosaic work when the chalk, mixed with water, is spread out before us.

A large number of the moss corals appear to us merely as scaly crusts upon the surfaces of the rocks and sea-weeds, often covering them with a thick coat of dirty sand colour, and, as those unacquainted with zoophytes would think, spoiling

the beauty of our prettiest marine plants, and infesting alike animal and vegetable productions of the ocean. In some cases we can at once see that these scaly patches are congregated cells; but it needs microscopic aid to reveal to us the fact, that in different species these cells are of different forms, and that in each cell lies a living creature, which, when it needs to bring the prey to its mouth, can awake to most vigorous activity, and extend its arms, covered with minute cilia or hairs, from the opening of its dwelling. The Lepraliæ, or sea scurfs, are thin calcareous crusts of white, yellow, or reddish, or purplish tints. There are more than thirty-five described species, and more probably remain yet to be discovered. The careless passers by would scarcely see them, or deem them but deformities; but our engraving, which represents the magnified cells of two species, will show that they possess a beautiful symmetry. Some of these scurfs are confined to particular species of sea-weed; others seem quite indifferent as to what surface they encrust, some grow only on shells, but all are parasitical.

The most common zoophyte of this class is that represented by our figure, which is known, though perhaps not by name, to all who have ever roamed by ocean's margin, with high intent upon the objects scattered around them. The large, horny, brittle, leaf-like substance, of the colour of moist wood, yet reminding us of a withered leaf, and at some seasons almost as plentiful as if it had been

scattered by the wind from some neighbouring tree, is the Broad-leaved Hornwrack (*Flustra foliacea*). If held up to the light we can see plainly that it is composed of clusters of cells.

These cells are formed on both sides of its substance, and their raised margins make the surface so rough to our touch. When placed under the microscope, we can see that the upper part of the margin of each cell is armed with four projecting horny spines, which appear to be designed as a protection to the polypes when they extend their arms. It has been observed, too, by Dr. Farre, that the transparent horny cell which closely surrounds the body of the animal, is nearly unyielding at the lower part, but is terminated at the

upper by a flexible portion, which serves to protect the upper part of the body when the whole is expanded, at which time it is as large as the rest of the cell; while, when the animal retracts, it is folded up and drawn in after it, and completely closes the mouth of the cell. The aperture of the cell is formed by a lid, which folds down when the polype is about to advance from it. These cells appear, under the microscope, like so many crystal cups, and each one is the dwelling-place of a perfect animal, united to its neighbours in the cells above and below him, by a common circulation. Wondrous, indeed, is the structure of these polypes; their little tentacles, or arms, surrounding the body like small bristles, are covered with innumerable minute cilia, or fringe-like hairs, all quickly vibrating, and acting on the water like so many paddles, producing all around them strong and rapid currents. "Constantly," says Professor Jones, "these streams of water pour along, some rushing along the aspect of each tentacle towards the mouth, and hurrying thither whatever food is brought within their influence. Escape out of the living whirlpool seems impossible, and every tiny being that approaches its dread margin perishes. Charybdis, with its fabled terrors, could not bear comparison with the fierce vortex thus produced. Soon as an animalcule comes within a given distance, it is whirled along directly to the mouth of the gulph, where, if admissible as food, it enters and is swallowed; or, if rejected, it is dashed away by other currents, running different ways, and hurried to a distance. Neither does our admiration cease after the food has passed the opening of the mouth, for, in the throat itself, innumerable

cilia are busily in motion, turning round and round the swallowed victim, urging it along until it reaches the stomach, where its struggles end." In a common-sized specimen of this hornwrack, at least 36,000 living beings have been computed to exist, each actively and rapidly vibrating the cilia which covers the tentacles. Nor is this all: this Flustra is often the point of attachment to other corallines, minute threads which creep over its surface, or crowd upon it in dense little tufts, or cover it with a mossy-looking substance, like a coating of down. Every filament, there, has cells containing living creatures, each perfect in its structure, and no less highly organized than the polypes of the sea-mat. Many persons, to whom this hornwrack is familiar, have observed its peculiar odour, and, when the polypidom is newly thrown up from the waters, it is often very pleasant. Pallas compares its scent to that of the orange; Dr. Grant, to the perfume of violets; and another writer describes it as mingling the perfumes of the rose and geranium. This latter description seems to the author to convey the best idea of the odour, such at least as she has found it; but it is probable that it may vary in different specimens, and she has sometimes picked up a dozen pieces, in not one of which any pleasant perfume was apparent, while some of them had a strong and disagreeable fishy odour. This hornwrack has been called Duck's-foot Conferva, and Curious sea-weed. A writer in Loudon's Magazine of Natural History, remarked of it, that, on exposure to the fire, it emits "a powerful acid smell, similar to that of lemons." The author has subjected many specimens to this experiment, and

in one or two cases detected a faint odour of lemon; but in most instances all sweet odour was overpowered by the strong scent of burning bones, or other animal substance, which the hornwrack gave out in the flame. This and the other hornwracks were formerly included under the name of Sea-mat; hence Linnæus gave the genus their scientific name from the Saxon *flustrian*, "*to weave.*"

The narrow-leaved Hornwrack (*Flustra truncata*) much resembles this, but it is of a thinner and more papery substance, and its segments are narrower at the base. Though very common in deep water on the Scottish coast, and on the northern shores of England, it is less generally distributed than the broad-leaved kind. Then there is a pretty yellowish-brown species, called *Flustra carbasea*, not uncommon on some coasts. The polypes in this species have about twenty-two tentacles, on which Dr. Grant remarks, "They are nearly a third of the length of the body, and there appears to be about 50 ciliæ on each side of a tentaculum, making 2,200 ciliæ on each polypus. In this species there are more than 18 cells in a square line, or 1,800 in a square inch of surface; and the branches of an ordinary specimen present about 10 square inches of surface, so that a common specimen of the Carbasea presents more than 18,000 polypi, 396,000 tentacula, and 39,600,000 ciliæ."

Some sea-mats form patches on our common marine plants, some inches in length, and they may be seen by the naked eye to be composed of a mass of cells. The membranous species (*Flustra membranacea*), so common on the fronds of the Laminaria, and different species of Fucus, forming

on their surfaces a gauze-like crust, is exquisitely beautiful under the microscope. The Rev. David Landsborough and Dr. Johnston have seen a specimen of this, five feet in length by eight inches in breadth: and Dr. Landsborough counted the cells on every square inch, each of which cells had been inhabited by a living polype, and found that this "web of silvery lace" had been the work and the dwelling-place of above "two millions of industrious, and doubtless happy inmates; so that this single colony, on a submarine island, was about equal in number to the population of Scotland."

Many are the wondrous zoophytes belonging to our own seas, and strewed about among the refuse of the ocean on our shores, which we must here leave unnoticed. Though familiarly acquainted with the objects named in this paper, yet the author is indebted for many of its details to the interesting facts discovered and accumulated by Dr. George Johnston. His valuable work on the British Zoophytes cannot be read by any intelligent person without wonder and delight. To many it has opened a new world of ideas. Viewing the subject with the feelings of a philosopher, a poet, and a Christian, his book is a source of gratification both to the scientific and the unlearned reader.

The verses which conclude the chapter were written by Calder Campbell, for this little volume:

"The sea! the sea magnificent,
On which we love to pore,
As if it were one huge extent
Of sage but secret lore;
Which, though upon the lesson bent,
Perplexes more and more.

Look down into its depths, where life
In such strange shapes is seen,
That he who thinks that human strife
On earth hath only been,
Will turn again to landward plain,
And own it more serene.

Life in each fish and finny creature
That revels in the flood;
Life in each tangled weed, by nature
Form'd for a curious brood:
Life in each shell of varied feature,
With many a tint imbued.

The spars that glitter up from chasms
Where zoophytes abound;
The shells, flung out from darksome pits,
To shine on sun-struck ground;
The plants that grow deep down below,
Whence comes a solemn sound:—

Those spars, shells, plants, have each and all
A God-given life within;
And solemn thoughts, in thickness fall
Upon my spirit, when
I think on man's superior claim
To grace, with all his sin.

But mysteries hide in heavenly love
As in the dark deep wave;
And all we know, or need to know
Of life, and of the grave,
Is that God gave to man a soul
For his own Son to save.

Nor, without object, gifted He
With life, those groups that grow
Like woodlands, in the quaint old sea,
Whose every bud and bough
Teems with existence; why, or how,
We cannot guess or know.

Enough to know that they, like us,
Were form'd by power divine;
Enough to know, that weal and woe,
That darkness and sunshine
Have each their time of reign below,
To end when He makes sign."

CHAPTER V.

VARIOUS COMMON OBJECTS OF THE SHORE.

"Now is it pleasant on a summer eve,
When a broad shore retiring waters leave,
Awhile to wait upon the firm fair sand,
When all is calm at sea, and still at land,
And there the ocean's produce to explore,
As floating by, or rolling on the shore;
Those living jellies which the flesh inflame,
Fierce as a nettle, and from that its name;
Some in huge masses, some that you may bring
In the small compass of a lady's ring.
Figured by hand divine—there's not a gem
Wrought by man's art can be compared with them;
Soft, brilliant, tender, through the wave they glow,
And make the moonbeam brighter where they flow."

CRABBE.

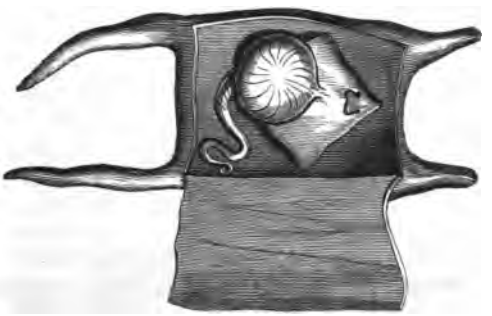
ONE of the most frequent objects on our shores is a yellowish ball, composed of a number of little bladders, of about the size of a pea, and of a membranous and tough material. These balls skim over the stones or sands on a rough day, never stopping till they fall into some cavity, or lodge themselves against the side of a boat or pier, where they often lie in numbers. They are the egg-shells of the common whelk, and when first deposited, are soft and full of a cream-like substance. They shortly harden, and the bladders then become full of small roundish eggs. There are sometimes as many as a hundred eggs in each case, though not more than four or five on an average come to perfection. The young animals,

when first hatched, are covered with a minute shell, which they enlarge as they grow older. The ball is often as large as an orange, and contains a great number of these egg-cases. One of an ordinary size was found by the author to consist of as many as two thousand five hundred. This mass of eggs is called on the coast bladder-chain, oyster-spat, sea-rose, or soap-ball or wash-ball. Ellis says of it, that in his time, sailors used it as soap, to wash their hands.

Our engraving will at once remind all accustomed to the sea-side, of another object on which

they have often looked; at which, perchance, in childhood, they have wondered much, doubting whether that olive-green leathery bag were not some kind of sea-weed. The Mermaid's-purse, or the Fairy-purse, was the name by which they called it in those days; and it is the egg-case of some of the several kinds of Ray-fish, or skate. It is open at both ends to admit the sea-water, and if we pick up any of the specimens so numerous during the months of September or October, we

find within, a substance resembling the yolk and white of a bird's egg. A little later, the partly developed fish may be seen; and finally, the skate fully formed, looking exactly like the large-sized



fish, and lying with its tail turned over its back, seems only waiting for a little more strength to emerge from the end open next to its head, into its new life in the waters. If taken home in this state, and placed in a bason of water, the young fish will gradually glide forth, and swim very complacently about in its native element. After a stormy day in November, numbers may be found in this condition.

But the Mermaid's-purse belonging to the dog-fish, a small species of shark, is a much prettier, though not so frequent an egg-case as this. It is smaller and thinner, sometimes of a dark brown, but frequently of a transparent horn colour, with threads proceeding from the four corners, often many feet long, making beautiful curled tassels, like the tendrils of the vine. These are coiled

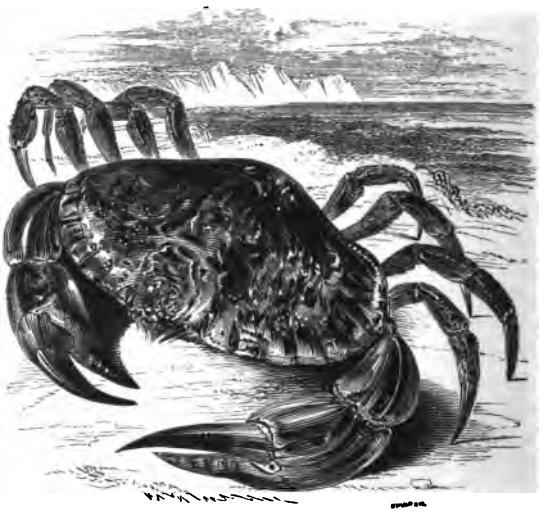
around the stems of sea-weeds, or broken wood, or on the projections of rocks, and fastening the egg-shell firmly till the little inmate is ready for its entrance into the waters, the waves may dash, and the storm may roar ever so wildly, yet is it as safe as if the sea were unstirred by a passing breeze.

Several crabs are to be seen on most parts of our shore, and few are commoner than that kind which, hermit-like, shuts itself up in a lonely cell, and passes the greater part of life away from its kind. Bernard the Hermit, or the Hermit-crab, or, the Soldier-crab (*Pagurus Bernhardus*), has a peculiar structure. The hinder part of this animal is destitute of the usual shelly crust in which most of the species are enveloped, and in an early stage of its existence, made conscious by its instinct of its frail and unprotected condition, it takes possession of some empty spiral or turbinated shell, which it finds upon the beach, among whose coils it can entwine itself, and putting forth its claws, crawl along, like the snail, with its home upon its back. Various shells may be seen thus inhabited; the crab, as it increases in size, setting forth in quest of a larger dwelling, into which it enters backwards, gradually winding itself in, and taking hold of the end of the spire by means of a hook attached to its tail. When the hermit-crab becomes larger, there are few common shells of size enough to receive it, except that of the whelk; but as these are usually plentiful, it is easy for it to find a castle. So frequent on some coasts are the hermit-crabs in the whelk-shell, that the writer found thirteen specimens in the course of an hour's walk on the beach of Dovor. The animal well

deserves its name of soldier-crab, for it fights with most determined spirit in defence of its shell; and the contest between the rival crabs contending for one dwelling, is most vigorous and fierce; and

if the opening of the castle is attacked by an enemy, the warfare maintained by the soldier is most amusing to witness. This crab creeps quickly over the shore, cautiously peeping forth to avoid danger. The right claw is generally larger than the other, and is protruded when the animal is at rest; but if any danger approaches, the crab retreats far into its shell, and putting the left claw over its head, and clasping it down with the right limb, it ensconces itself so securely, that it is not easily injured, unless the shell be broken. This

crab is said, when seized, to utter a faint cry. It certainly takes so strong a hold of its foe, that the finger thus grasped would be glad to withdraw



itself, as the hermit will suffer itself to be killed rather than relinquish the hold.

We have several common crabs, as well as other crustacean animals, hiding in the holes among the rocks, some of them walking sideways over the sand, and if touched, making most rapid efforts to hide themselves behind a sheltering stone, or under the friendly leaf of a large sea-weed. One of the most frequent kinds, the common shore-crab (*Carcinus mænas*), really well deserves the name of *le crâbe enragé*, by which it is known on the French

coast, where it is as common as on our native shore. If any attempt is made to touch it, it runs along in a most excited state, and hastens to bury itself in the sand. If seized before it can make its escape, it fights most desperately, striving with all its might to seize and pinch the fingers, and moving its claws in most defiant attitudes, while, when no resource is left it, it will leave its claws behind, and get away by means of its smaller limbs. Nor does the animal appear to suffer from its loss, for though it can move but slowly, there is no indication of pain. Could we again see this maimed crab, we should probably find, that after a while it had renewed its limbs; for in common with other crustaceous animals, it has the power of reproducing them from the remaining portion of the old ones. We often see a lobster brought to table with one limb longer than the other; a condition which was probably caused by its having, in some encounter with an enemy, dropped it in its grasp, while the one more recently produced had not attained its full size at the time when the lobster was captured.

This crab is a common article of food in towns contiguous to the sea, and is sold in the streets both of London and Paris; but it is inferior in size and flavour to the larger species found very generally around our coasts, and usually abounding on such as are rocky, often to be seen after the tide has withdrawn from the rocks, hiding itself there among the sea-weeds. The flesh of this crab (*Cancer Pagurus*) is esteemed a great delicacy. The French call it *le crâbe poupart*, or *le tourteau*. The large kinds keep out on the rocks in deeper water, where they are caught by men who go out

in boats, with creels made of basket work, baited with thornback, skate, or other fish; and like other crustaceans, the crabs are not particular as to the nature of their food, being destined to consume the refuse of the sea.

Some of the most beautiful of our British crabs are those termed Velvet-crabs, on account of the velvety down with which the shell is covered, and

which extends even to the limbs of the animal. They are of reddish colour, tinged with blue. One of these, commonly found on our shores (*Portunus puber*), is about two inches and a half long, and much esteemed as food. Its colours are remarkably bright.

Then there are crabs on our coast with triangular

bodies, and long thin hairy legs, so like the spider, that fishermen call them the spider-crabs; and there is a little crab not at all unfrequent in the shell of the mussel, which is the subject of many an ancient legend. This is the Pea-crab (*Pinnotheres pisum*), a tiny creature, belonging to a group of small crustaceans, which dwell between the mantle lobes of the mussels and pinnæ, as well as those of some other bivalve mollusks. The ancients had strange poetic fancies respecting these pea-crabs, nor were they entirely rejected by naturalists or poets of modern times, though disproved by the investigation of recent science. Old writers told of a singular friendship existing between these little animals and the mussels, relating how, while the mussels lay with open shell to catch their prey, the crab, espying its approach, would give the shell-fish warning, so that it might suddenly close its shell upon the animal. In return for this, the mussel was reported to give the crab its home and food, for no sooner was the shell closed than the two friends shared the feast. Hasselquist, who visited Smyrna about a century since, writing thence, expatiates upon the valuable services of this little crab, though he has a different tale to tell of its doings. He observes, that the great silk mussel is found there, and that some of the cuttle-fish watch for it to open its shell, when, putting in their long arms, they would seize and devour the fish. But the sentinel crab, through the small opening of the shell, was said to keep so good a watch upon all enemies, that on their approach it moved, and gave warning to its hospitable entertainer, which immediately closed the doors of its dwelling. It appears, however, that

these little crabs have a soft and thin crust for their only covering, and that they repair to these shells for shelter, as the hermit-crab would to that of the whelk.

The lobster (*Astacus marinus*), though not so general on all our coasts as the common species of crab, yet is by no means rare on rocky shores, and in some places very abundant. Every one is familiar with its general appearance, its eyes set upon stalks, enabling it to see all around; its long ringed jointed horns, and the articulated plates of its tail. There is not altogether much in its appearance which at first sight would excite an interest, but to the careful observer it presents an object in which the skill of the great Creator is most beautifully manifest. Its plates are moved by very powerful muscles, and if the lobster suddenly contracts these, it has power to dart backwards with astonishing rapidity. Sometimes, when coming out of its hole in the rock, in search of food, it meets with an enemy lying in wait to seize it; but no sooner does it see its danger, than it expands the moveable plates of its tail, contracts the muscles, and bringing it down with much force, flaps it up against the lower part of the body, and darts backwards with inconceivable velocity, so that the eye can scarcely follow its motion, and that of the bird of the air, or the flash of lightning, may serve as a comparison. By these means the lobster will secure himself in small holes, in little crannies where we should deem it impossible that it could enter. In the water it can run nimbly along, or dart forwards by means of its tail, with great quickness. The claws, too, present another instance of a beautiful contrivance

for its use. In looking at the nippers of the larger claws, they may be seen to have little knobs or tubercles at the margin, while the edges of the smaller are toothed or serrated. With the knobbed pincers the lobster keeps a strong hold on the stalks of the sea-weeds, while the other serves it for cutting and mincing its food, which it is said thus to do very dexterously. It is well known that the lobster is a voracious and active hunter, eating all kinds of food, preferring it in a state of corruption, thus aiding essentially in clearing away putrescent substances, its large strong claws fitting it for tearing stronger and tougher objects than the leaves of the marine plants.

The immense consumption of this animal as food, is provided for by the great number of its eggs, sometimes nearly twenty thousand being produced by one lobster.

The lobster, in common with other crustaceans, changes its coat of armour; for it cannot, like the molluscous animal, add to it by secreting a fresh layer, as it increases in size. Its crust is of one piece, and formed at once, not of the same substance as the shell of the mollusk, but consisting of animal matter and phosphate of lime. Nor is it alone the coat of mail—the crust of plates—which the crab or lobster throws off to take another. Even the covering of its eyes, the living membrane of the stomach, the teeth connected with it, and all the expansions or tendons to which the muscles of the claws are fastened. Slipping out of all these, the soft body soon secretes a crust better fitted to its later stage of development. Instances have been known in which the ever-hungry lobster has been lured by the bait into the creel of the fisher-

man, just when about to cast its shell, and when the fisher has handled his prey, the animal has, to his surprise, slipped out, and left him holding in his hands the empty case.

Equally provided with the lobster for swiftness of motion, is the little shrimp, whose cunning-looking eyes seem watching our every movement, as it darts about in the pool. The common shrimp (*Crangon vulgaris*) is remarkably active; and, destined to serve as food, and to perform the no less important service of devouring the refuse of the sea, it is very abundant. Paley says of it,—"Walking by the sea-side on a calm evening, upon a sandy shore, and with an ebbing tide, I have frequently remarked the appearance of a dark cloud, or rather very thick mist, hanging over the edge of the water, to the height, perhaps, of half-a-yard, stretching along the coast, as far as the eye could reach, and always retiring with the water. When the cloud came to be examined, it proved to be nothing else than so much space filled with young shrimps in the act of bounding into the air, from the shallow margin of the water, or the wet sand." We have here an instance of a mass of numbers reminding us of the overwhelming flight of locusts in the east; and every one who has seen them on the sandy shores, must have observed how numerous they are there. The larger and more beautiful Prawn (*Palæmon serratus*) is less gene-

rally distributed than this common species, though occurring, in some places, in abundance; but the Opossum-shrimp (*Mysis Fabricii*), represented by our figure, is almost as plentiful. Its name relates to the pouch or bag which holds the eggs in the female shrimp.

Who has not looked upon sea and sky—on such a scene as that described by the poet:—

> "Star after star, from some unseen abyss,
> Came through the sky, like thoughts into the mind,
> We know not whence: till all the firmament
> Was throng'd with constellations, and the sea
> Strown with their images."

Was it the bright reflection of the glittering orbs of heaven, of which the poet sang when he wrote these lines? Did their bright images, strown over the calm surface of the waters, on some still summer evening, suggest the poetic resemblance to the thoughts coming we know not how, arising from some association of which even those who are most intellectually observant can take no cognisance? And yet his statement would have been no less true, had he been thinking of the literal fact of the multitude of star-like forms with which the sea is teeming—forms so radiant, and some of them so bright with phosphorescent light, that even the peasant calls them star-fishes, and the philosopher, ever in some sort a poet too, once said of them,—"As there are stars in the sky, so there are stars in the sea." Assuredly, both sea and shore are strewn with myriads of starry animals, though they are few in number, compared with what they were in these olden ages, of which fossil remains tell us, when star-fishes, of extinct and beautiful forms, affixed to stalks, waved in multitudes in the seas, and having performed their appointed living

part in creation, went to form the crust of the earth on which man was to dwell, and leaving their petrified figures in the limestone rocks, in the mountain chains, traced there a history which should be read by the thoughtful and intelligent of future ages of mankind.

Every one accustomed to examine collections of geological specimens, or to roam about the regions of limestone districts, must have seen the stony remains of these extinct star-fishes, in their most perfect state resembling the stem and flower of a lily, and hence called popularly lily-stones, and by the geologist termed *Encrinites*. The stalk is composed of little lozenge-like pieces, resembling small and nearly solid wheels, with a cinque-foil in the centre, and the fragments of these are very abundant. They are commonly called St. Cuthbert's beads, and old tradition had much to tell of these and of some other common fossils. Some fossils are still in the North of England popularly called snake-stones, and petrified snakes, and stories are yet in existence of which ancient tales—

> "told
> How of a thousand snakes each one
> Was changed into a coil of stone;"

while to the broken fragments of the star-fishes of the older world belong legends to which Sir Walter Scott alludes:—

> "Nor did St. Cuthbert's daughters fail
> To vie with these in holy tale:
> ——On a rock by Lindisfarn,
> St. Cuthbert sits and toils to frame
> The sea-born beads that bear his name:
> Such tales had Whitby's fishers told,
> And said they might his shape behold,
> And hear his anvil sound;
> A deaden'd clang—a huge dim form,—
> Seen but, and heard, when gathering storm
> And night were closing round."

When we think of the immense strata of Encrinite marble which in some regions, as in Derbyshire, are composed of these innumerable lily-stars, showing that our seas must once have been full of them, it seems strange that stalked star-fishes should now be so rare. Once they clung by their long stems to the rocks down deep in the blue seas, and firmly fixed there, spread out their fringed flower-like arms to entrap the living nutriment afforded by the waters. Perhaps, like the modern tribe of star-fishes, they were the scavengers of the sea; but we have no means of knowing whether they were at any time enabled to free themselves from their stalk, and glide about in the deep. One beautiful stalked star-fish alone remains, and this is affixed to a stalk only at an early period of its existence. The lovely Feather Star (*Comatula rosacea*) is found attached to the stems of sea-weeds and corallines, and is a bright rose-coloured animal, much resembling a flower, but not, while in this condition, more than half or three quarters of an inch in height.

But this lovely object is not one of the common things of the sea-shore, though various other species of star-fish are among the most frequent and familiar of all the things to be seen there. Commonest of all, is that star-fish known on the coast by the name of Five-fingered Jack, because its rays are usually five in number, though in some instances it has six. This animal (*Uraster rubens*) is on some parts of our coast termed the Common Cross-fish, and the people of Cornwall call it Clam, or Clamp. It is so abundant as to be sometimes collected for manure, and well may it be so, for one single star-fish will produce a thousand of its pro-

geny in one season. Every one knows this common animal, which is more or less of a reddish yellow colour—in some cases of a purplish tinge, and varying in size from a specimen which might lie in the palm of the hand, to one six or eight inches in diameter. This star-fish, though at first sight not a particularly attractive one, should be taken home and placed in a large vessel of sea-water, or carried to some rocky pool, if we would see its wondrous and beautiful structure. If placed in a glass jar on its back, one of its first movements will probably be to turn itself round. This it does by folding over two or three of its rays, and then, with a sudden jerk, placing itself in its right position. If we look at its under surface, we shall discover, along each ray, a calcareous framework, composed of regular portions, commencing at the central mouth, and extending in a furrow to the tip of the ray. In this groove are many orifices, through which are protruded small fleshy suckers, which serve as legs, and each of which is terminated by a disc. More than three hundred of these suckers are placed on each ray, and we need no microscope to enable us to see them, moving sometimes all together, at others, only a few at a time. And well do these moving legs serve also to hold down the prey. Our star-fish has an appetite not easily satisfied. It has to cleanse the waters near the shore of that offal which else would pollute the atmosphere; and the great Creator, who appointed to the star-fishes their occupation, gave them the inclination and the power to perform it. Nothing comes amiss to them. They can feed on the decomposing mass of dead animal matter, can swallow alike the

gliding silvery fish, and get from within its hard shell the mollusk apparently so well protected. Helpless as this animal would seem as it lies on the beach, it can conquer creatures which have greater strength and activity than itself. While lying in wait for its prey, it may chance that a crab comes within the grasp of its rays, which are ready bent in attitude for seizure. No sooner does the animal come in their reach, than the rays are closed down upon it, and vigorous as may be the struggle, escape is impossible, for all the suckers come out of their orifices, hold it down, and drag it to the mouth, where it is swallowed. The capture of the oyster might seem even a more difficult thing for the star-fish, yet it devours an immense number of these shell-fish, and is consequently in ill repute with the fishermen. The ancients, and many modern writers too, have told that it contrived to reach the mollusk enclosed in its shell, by insinuating one of its rays between the valves, when they happened to lie partly open. Thus the poet says:—

> "The prickly star-fish creeps with fell deceit
> To force the oyster from his close retreat;
> When gaping lids their widen'd void display,
> The watchful star thrusts in a pointed ray;
> Of all its treasures robs the rifled case,
> And empty shells the sandy hillock grace."

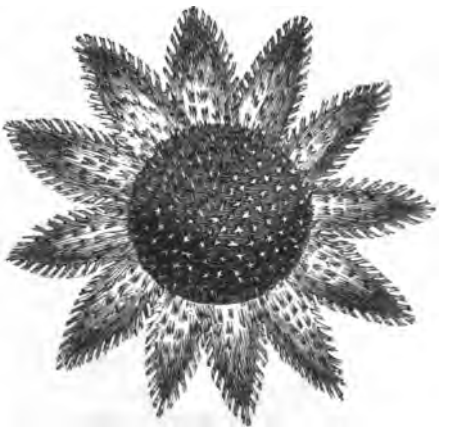
But though the star-fish does not thus "employ its rays as an oyster-knife," yet Professor Jones, in his most delightful book, "The Natural History of Animals," describes this process, which, as he says, is unique. The animal seizes upon the shelly valves of the oyster, and "proceeds coolly to turn its stomach inside out; it then, perhaps, instils

between the shells some torpifying fluid, which deprives the oyster of strength, and soon compels the prey to open its defences. The stomach of the star-fish, now distended like a bladder, is pushed in, and made to enwrap the oyster, which is soon digested, even in its own shell, and furnishes a meal for its uncourteous visitor."

Professor Forbes, too, considers it probable that the star-fishes have some acrid stinging fluid, which, like that of the sea anemone and sea nettles, serves to stupify the prey. It is commonly said, that this species possesses it in such power, as that it will sting those persons who touch it. But this is an assertion which may easily be disproved; as we may pick up hundreds on the shore, and find them all harmless to the touch. Their great destruction of oysters has been long attested; Bishop Sprat, in his "History of the Royal Society," treating of the oyster, says, "There are great penalties, by the Admiralty Court, laid upon those that fish out of those grounds which the Court appoints, or that destroy the Cultch, or that take any oysters that are not of size, or that do not tread under their feet, or throw upon the shore a fish which they call a Five-finger, resembling a spur rowel, because that fish gets into the oysters when they gape open, and sucks them out."

Scarcely less frequent is the common sun-star (*Solaster papposa*), which is much handsomer than the cross-fish. It has usually ten or twelve, though occasionally fifteen rays. It is commonly of a reddish purple colour, but sometimes the centre is red, and the rays are white, tipped with red and white or straw-coloured beneath. Like the cross-fish, it is found on oyster banks; but it is fre-

quently thrown by the tide on the shore, or dragged up in nets, or on the hook of the fisherman. Some of the largest specimens measure nine inches



across. It is very voracious, and generally found in deeper water than the last-mentioned species.

All our British star-fishes are not so distinctly rayed in the star-like form. Thus we have the Bird's-foot Sea-star, an animal of a pentagonal shape, with very blunt angles, and of a white colour, marked with a red centre and fine red rays. It is thin, and when alive, flexible, like a piece of leather. Then we have the pretty little Gibbous Starlet, rarely measuring an inch across, and very common on some shores, though apparently confined to the south and west coasts of our island; and the knotty Cushion-star, and others which may be described as having five angles rather than rays.

These and some others, with the exception of the Comatula, belong to the true star-fishes, but the Brittle-stars and the Sand-stars are placed in the family termed by Professor Forbes *Ophiuridæ*. These are the star-fishes which are most numerous in our seas. Not that the species are many in number, there being twelve only, but that the individuals are very plentiful. Our engraving represents one of them, often thrown by the wave on the shore, and on some coasts, as at Dovor, it is one of the most frequent species. The common brittle-star (*Ophiocoma rosula*) is a more elegant

species than any other of the very general star-fishes. Brittle, indeed, it is, not only breaking up by a touch from its natural fragility, but evidently possessing the power of dismembering itself at its will. "Touch it," says Professor Forbes, "it flings away an arm: hold it, and in a moment not an arm remains attached to the body." Its disc is often of a dim rose-colour, with grey scales, some-

times white, spotted with red—often marked with a star of red or yellow, and occasionally nearly black. The rays are usually white, banded with pink—often of a deep blue, with rose-coloured spines, banded with bright yellow, or speckled with brown and orange. It is fond of rocky shores, and rarer in sandy localities. The Professor remarks of these brittle-stars, "I have seen a large dredge come up, completely filled with them; a most curious sight, for when the dredge was emptied, these little creatures, writhing with the strangest contortions, crept about in all directions, often flinging their arms in broken pieces about them, and their snake-like and threatening attitudes were by no means relished by the boatmen, who anxiously asked permission to shoot them overboard, superstitiously remarking, that the things 'weren't altogether right.'" These brittle-stars feed on small shell-fish and crabs, and are, in their turn, food for the larger fishes. This species is most brilliantly coloured, and is very general around our shores.

Another very pretty, though less common species, is the brightly tinted Daisy Brittle-star (*Ophiocoma bellis*), with its long twisting rays. Its disc presents a surface of intermingled spines and plates, which sufficiently resemble our meadow flower to suggest its name. "Nor," says the writer before alluded to, "is the flower at all degraded by the comparison, for but few daisies can show such beauty of form and colour, as is presented by this sea-star."

All the brittle-stars have long slender rays, and some have rays like tendrils, scarcely thicker than twine, and composed of many articulations. They

are in some species seven or eight inches long, and twisting about in most graceful convolutions, they could not fail to interest those who regarded them. Fragile creatures are they all, not only having the power of breaking up the arms into pieces, but these pieces again actually dividing themselves into others, so that when seized they will often leave only their disc whole. Equally with the true star-fishes, they can reproduce their rays, and may therefore safely indulge their excited feelings.

One of the species of the true star-fishes, is brittle as even the most fragile of the brittle-stars; this is the Lingthorn (*Luidia fragilissima*), an animal which is sometimes two feet in diameter, and has five or seven rays. It is of an orange or red colour. Its singular power of breaking itself up, in its indignation at being taken, is related in so amusing a manner by the Professor, that justice can be given to his description only by quoting his words. This as well as several other species is rarely cast on sand or shingle, but must be fetched up from deeper water by the dredge. The author had succeeded in getting a Lingthorn into the boat, and not aware of its peculiarites, had laid it on a bench for examination. "On attempting," he says, "to remove it for preservation, to my horror and disappointment, I found only an assemblage of rejected members; my conservative endeavours were all neutralized by its destructive exertions, and it is now badly represented in my cabinet by an armless disc and a discless arm. Next time I went to dredge on the same spot, determined not to be cheated out of a specimen in such a way a second time, I brought with me a

bucket of cold fresh water, to which article star-fishes have a great antipathy. As I expected, a Luidia came up in the dredge, a most gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sank my bucket to a level with the dredge's mouth, and proceeded in the most gentle manner to introduce Luidia to the purer element. Whether the cold air was too much for him, or the sight of the bucket too terrific, I know not; but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge his fragments were seen escaping. In despair I grasped at the largest, and brought up the extremity of an arm, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision." The red spots to be seen at the end of every ray of many star-fishes, surrounded by spines, have by some writers been called eyes, and it is to this part of the animal which the Professor alludes in the latter sentence.

Very nearly allied in structure to the star-fishes, are those animals generally called sea-eggs, or sea-urchins, whose rounded shells are so often thrown on the beach. All have seen some of the commoner kinds lying among the rocks, or placed on the chimney-pieces of houses near the sea, or deposited in the museums of science; while their fossil remains, often perfect in form, are found in the flint and chalk in abundance. These shells are covered with tubercles, placed in regular rows all down their globular surface, and to these tubercles, during the life of the animal, were affixed jointed spines. Minute differences exist in the form of the spines in various species, but so regular and

exact are they, that a good zoologist can determine the species by the examination of a single spine; a circumstance most important when investigating their remains in a fossil state, as sometimes this may be the only portion which he can procure. Most wondrously suited to the wants of the living creature within the cell, is the structure of these spines. No rock is so smooth or so rugged but that by their help the animal can make its way. Its meal lies before it among the rocks; the zoophytes, the shell-fish, the crabs, are all welcome prey, nor are they longed for in vain. To look at it, it would seem a mere ball, incapable one would imagine of attacking or seizing any living thing that had limbs with which to walk away, or fins by means of which it could glide out of its presence. One would deem it almost like the zoophyte, chained to its native rock. Not so; it can climb to places where animals which seem better fitted for locomotion would find access impossible. Cased in a coat of mail, and furnished with hundreds of spines which serve as legs, the ball moves gently onwards. If an approaching enemy gives notice of danger, it can either withdraw behind some nook, or with the spines dig a hole in the sand, and lie there till it is past. Besides the spines, countless suckers aid the progress; suckers, which like those on the star-fish, emerge from the calcareous case, and which are as long as the spines themselves. These suckers are like little feet, and adhere firmly to rocks, and serve too as means of offence and defence to the animal; for if the crab or fish is touched by them, the touch proves fatal, and the victim is at once dragged to the mouth and devoured. Its mouth

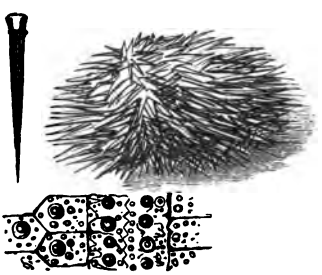
is most curiously constructed. It is an orifice surrounded by a fleshy ring, and set with little teeth so sharp, and jaws acted upon by muscles so powerful, that it can bite through very hard substances. The whole structure of these sea-urchins is truly wonderful. The description given by Professor Rymer Jones of the shelly case, is most simple and striking. "The crust of the Echinus," observes this writer, "when denuded of its spines or stripped of its external covering, would seem to be an ordinary shell, having its outer surface covered over with polished tubercles, regularly arranged. Of these the largest are disposed in lines that pass from pole to pole of the round box, like lines of longitude on the globe of the geographer. Intermixed among the larger tubercles, are seen innumerable smaller eminences of similar construction, but dispersed with less precise arrangement, upon all of which, when in a living state, spines were attached in correspondent number. Moreover, placed at intervals between the spine-crowned tubercles, are ten broad bands disposed in pairs, all pierced with countless holes: these too extend from pole to pole of the round box, and through them, during life, the locomotive suckers passed, used for climbing rocks and for attachment to some foreign body. On cutting through the shell so far as to see its inner surface, we perceive, to our surprise, that far from being, as it appears externally, a simple shelly exudation moulded to the form of the Echinus, like the shells of lobsters or mollusca, it is a very complex fabric, built with most consummate art, consisting of some thousand pieces, varying in size but shaped with mathematical precision, and composed with

so much accuracy that the eye can but with difficulty trace the lines of union. Tell a human artisan, however versed in geometrical proportions, to cut a thousand plates, polygonal in form, and fit them to each other, leaving not the slightest space between their margins anywhere, so that the whole shall form a hollow sphere of certain given proportions, how would he succeed? Doubtless he would pronounce the problem quite impracticable. But in the shell before us, this is just what nature has achieved most perfectly. First we should observe five double rows of oblong plates, pentagonal in form, which on their outer surfaces present the spine-supporting tubercles. On either side are found innumerable pieces, of smaller size, but equally exact in shape, through which are bored the perforations for the ambulacral feet; and these are again separated from another row of perforated plates, by other intermediate pieces, having spines affixed externally. These plates are mostly pentagons in form, with sides of various length; but all combined, fit each other so closely that their combination serves to form one solid compact shell."

The species of sea-urchin which is most frequent on our shores, is that called the Common Sea-egg (*Echinus sphæra*). Forbes gives as one of its familiar names that of Sca'ad man's head. Though usually of globose shape, it varies in form, and is sometimes so much flattened that even experienced zoologists have mistaken it for another species. These stony balls are to be found of all sizes up to a globe of fourteen inches in diameter. This sea-egg has usually a reddish or purplish tinge, with white spines sometimes tipped with purple.

It lives in various depths of water, and the animal, like the rest of its tribe, has a number of sharp and hard teeth, and feeds exclusively on animal prey. It is in some countries much used as food, and resembles in flavour the species known as the Esculent Sea-urchin. The people of uncultivated regions, who live near the shores, consume many of the sea-eggs, and the ancients regarded them as delicacies, eating them either raw, or dressed in various ways. The sea-gulls feed on many of the smaller species, as the Green-pea Urchin, breaking the shells with their strong beaks, and sucking out the animal within.

This green-pea urchin (*Echinocyamus pusillus*,) is a frequent species on the shore, and is the smallest of the sea-eggs. When the animal is



living, the shell is of a bright green colour, just of that brilliant powdery nature which we find on the shelly cases which shield the gauzy wings of some of our brilliant beetles. When the animal dies, however, this gay colour is all gone, and the shell is of a dingy white tint. It is very common among sand, and its spines are very short and crowded.

Scarcely larger than this is the Purple-tipped Urchin (*Echinus miliaris*), which is often found with the common egg-urchin on oyster-beds or scallop-banks, and is sometimes mistaken for the young of that animal, but may be known from it by its much larger purple spines. It is rose-coloured, with white tubercles; some of the spines purple, and others yellow. This, though very abundant in the Irish Sea, and on the south-western shores of Scotland, is not a frequent English species.

There are a number of less known kinds of sea-urchins, distinguished by names significant of their form, or of some peculiarity in their appearance. Thus we have Heart urchins, and Fiddle-heart urchins, and Cake urchins; names all expressive of the shape. And we have the Silky-spined urchin, well named from the bright glossy lustre of its spines; and the Rosy-heart urchin, whose colour might vie with that of the queen of flowers. Of the four British species of Heart-urchin, one is very common and diffused through all the European seas. Most persons accustomed to roam about in those sandy bays so delightful to the marine zoologist, have seen sea-eggs of this species thrown upon the shore, after the angry waves have spent their wrath upon it. The common Heart-urchin or Mermaid's-head (*Amphidotus cordatus*), is also often called Child's-head urchin, or hairy sea-egg. It is broadly heart-shaped, much depressed in the middle, and thickly set with fine hair-like spines. Its colour is a yellowish white, and it is usually about an inch and three quarters long, and very nearly of the same breadth. These animals, and some others of a similar nature, were found, on

being opened by Professor Forbes, to have their intestines filled with sand or mud, which they had probably swallowed for the sake of the animal matter mingled with it.

Many who have resided for a time on some parts of our coasts, have heard of those singular animals termed Sea-cucumbers and Sea-gherkins. They are brought up by the dredge from deeper waters, and we must not expect to find them lying about among the common things of the beach; for rarely indeed do the storms bring them there. Slimy creatures they are, and usually by no means attractive; yet they deserve notice on account of their singular nature and habits. Resembling in the different species, more or less, the cucumber in form, and covered with a slimy substance, which renders them disagreeable to the touch; they are oblong animals, tapering at the ends, and covered, like the star-fish, with rows of suckers; while beautiful feathery tentacles surround the mouth. Some of the species seem very apathetic, but others are lively and active animals. There is one most remarkable fact recorded of them. We have seen how the star-fishes, when irritated, can break themselves up into many pieces. The sea-cucumbers have the still more wondrous faculty of vomiting up the whole of their internal structure, sometimes leaving not a trace behind of their organs, save the empty sac. Yet the animal apparently suffers nothing from its enraged action. It can live on without these organs, and in the course of three or four months can reproduce them. Other species of sea-cucumber can separate themselves down the middle; and can, in process of time, become two perfect animals. Their intes-

tines are generally found full of coral or similar substances, sometimes in large pieces. Unpleasing as are these animals to us, yet the Malays of the Oriental Isles search for them, in order to sell them to the Chinese; and fleets of the Malay boats visit the isles at the north of Australia, and the shores of New Holland and New Zealand, to procure them. As Rymer Jones humorously remarks, "They form an important addition to the fried earthworms, swallows' nests, and other luxuries which grace a bill of fare in the Celestial Empire." These *Holothuriæ* are more plentiful in the East than in our seas, though we have fifteen species, and there are probably many yet undiscovered. They are sometimes found in numbers among the tangled masses of sea-weeds near the shore, but are more frequently procured by diving; and when split and dried over the smoke of a wood fire, are termed Trepang. In the Moluccas, the pine-apple *Holothuria* is nearly two feet long. On the Neapolitan coast, too, the sea-cucumbers are large and plentiful, and they there form a common article of diet to the poor.

But passing on to the common animals of our coast, we must advert to the Prickly Sea-mouse (*Aphrodita aculeata*), which, during the winter months, is not an unfrequent visitant of various parts of the shore, where it may be found lurking on some ridge of sea-weeds which the tide has left to tell where it has flowed. At Dovor this little creature may often be picked up after a stormy day; but he who searches for it must not expect to find any very marked resemblance to the mouse of the field or dwelling. Unlike that little bright-

eyed creature, it is not sleek and plump, but it resembles it in one circumstance, rare among the inhabitants of the sea, in that it has silky hairs thinly scattered about it. Stiff bristly hairs also are placed on its upper surface, which make it a rough-looking animal. These are often half an inch long, and of most beautiful iridescent hues, reflecting the red, or orange, or green, or violet, which glitter on the neck of the drake, or gleaming forth like gold, which ever and anon betrays some tinge of green or purple. The sea-mouse is oblong, rather flat, from five to six inches in length, and its upper surface covered with double rows of plates, which overlap each other, and underneath these are the little fleshy tufts, which are the aërating gills of the animal. It retains its beautiful metallic lustre if preserved in spirits. Dr. Drummond found, on placing a sea-mouse in fresh-water, that it almost immediately sunk to the bottom of the vessel, and never again exhibited the slightest symptom of life or motion.

This singular little mouse belongs to the *Annelides*, a class comprehending a great number of animals, varying in general appearance, but having bodies of an elongated form, composed of rings at certain distances from each other. The common earthworm is a familiar instance of their structure; and any one who has watched its bending attitudes, as it glides in and out, may have seen the rings which encircle its body. By far the greater number of the annelides live in or near the sea. The common Lug-worm too (*Arenicola piscatorum*), that reddish worm, about a foot long, so frequent on our level sandy shores, is an annelid. It is very useful to the fishermen for bait; and if

we touch it, it stains the hand with a yellow fluid.

Every one, in rambling about our shores, must have seen weeds, shells, stones, and other objects, which have long been lying under water, covered with twisted calcareous tubes, sometimes crowded together in masses, and most curiously intertwined in each other. At other times the tube is found occupying a single shell. Sometimes square pieces, formed of dozens of tubes unattached to any object, lie upon the beach or are dredged up from the sea, but the most frequent cluster of them is on some old oyster-shell, which they will cover with their coils like so many little stony serpents; several species often congregating together. The shelly tubes are made by the different kinds of *Serpula*, secreted, like the shell of the mollusk, by the worm itself; but, unlike that shell, unattached by muscles to the animal within, and unadorned by brilliant colours. But if the shell is less gay, the beautiful animal within may vie with the most richly-tinted mollusk, both in colour and in graceful form. If placed in a vessel of salt-water, the tiny creature soon emerges from its tube, presenting to our view a brilliant coronal of gorgeous scarlet or rich purple, a fan-like array of plumes which serve it for organs of respiration, and which, moving up and down in the water, awaiting such prey as they may find available, are beautiful as the most elegant feathers.

Among the commonest of our native species is the Vermicular serpula (*Serpula vermicularis*), whose white tapering rugged cylinders adhere to plants and stones, or curved in all forms are cemented to the surface of some refuse shells,

winding all over them, or occasionally lying as a single tube upon them. This, like all the others, has beautiful fan-shaped plumes for breathing organs. They are, in this species, of deep blue, and among them is placed the mouth, surmounted by a stalked funnel. Our figure represents another species, the Contorted serpula (*Serpula contortuplicata*), sometimes found on our shores, and often placed in cabinets. In this species the fan-like bunches of plumes are exquisitely delicate, and gorgeously coloured with red, varied with orange and violet.

A common annelid, the Spirorbis, was slightly mentioned on an earlier page. This little animal, which is represented in our engraving of the Serrated Fucus, and of which also a magnified figure is there given, is a small shell resembling in shape that of some of our land snails, seldom much larger than the head of a pin. The Nautilus-shaped Spirorbis (*Spirorbis nautioides*), found on our sea-weeds, is a white and wrinkled shell. It is more common on the Serrated Fucus and Podded Halidrys than any others, but is not confined to them; and is so plentiful, that we may walk down to the rocks where the olive sea-weeds

grow, on any summer day, with the certainty of finding it. When examined with a microscope, the shell is seen to be shaped exactly like that of the nautilus, and of a beautiful white silvery nature; and when the little worm within puts forth its delicate radiated branchial organs, like so many exquisite feathers, we are ready to believe that scarcely any object in nature can be more lovely or graceful. The shell is flat on one side, and when severed from the sea-weed is seen to have the flat side composed of a thin delicate substance, like gauze-paper; for the sea-weed forms a wall to the little dwelling, and, therefore, the animal needs not to secrete a thicker material at that part.

Some of the marine annelides line the holes in the sands in which they live with a calcareous lining; some make for themselves the most curious and interesting little dwelling-places, composed of broken shells firmly agglutinated together, a curious mosaic work of little squares, and angles, and circles, as the shape of their pieces may chance to be. One little worm, unable to construct a dwelling for itself, finds one exactly fitted to it in the old shell of the mollusk, commonly called Tooth-shell (*Dentalium entalis*), that little shell so common on our coasts, shaped like a small horn. This is taken possession of by the tooth-shell Siphunculus (*Siphunculus dentalii*), which, having entered, seals up the entrance with a strong and fixed plug of grains of sand cemented together, leaving on one side a small circular hole, through which it may protrude its long proboscis in search of prey, yet small enough to prevent the entrance of any enemy into its home. This worm is about

three quarters of an inch long, white and opaque, and when seen under a microscope is found to be wrinkled with little rings. And it is wonderful to think of that instinct with which it has been endowed by the Creator, to find a safe dwelling place, constructed for it by an animal altogether so different from itself.

Not less curious are the little mosaic-work tubes of the Terebellæ. Many species of these worms frequent our own shores. Their bodies are very similar to that of the Serpula, and they construct their dwellings by spreading out their tentacula on the sand, till such pieces as they there select are attached to them, and then brought down to the neck. Here the tube commences, "being arranged," as Professor Jones has observed, "with as much regularity as rows of bricks, and cemented together by the tenacious exudation, until a tube is formed encasing the upper part of the creature's body." This tube is sometimes several inches long, and the whole process may be observed by placing the Terebella in a vessel, and putting within its reach the different materials needed for its singular dwelling-place.

The Terebellæ inhabit the sandy shore between high and low-water mark, usually quite buried in it to their upper opening, but as the action of the water sometimes raises or depresses the spots in which they are found, they are occasionally seen covered with sand rising some inches above them, and at other times are left quite uncovered.

The animal while forming its dwelling moves its head continually, from side to side, and it expands its feelers to the length of two inches, when it uses them for digging particles of sand. In summer, if

deprived of its sand tube, and placed in water with a bed of sand and fragments of shells at the bottom, it will in the course of four hours build a new habitation; but in winter, when the animal is not in full vigour, it will require an hour or two longer for its process.

Many of the naked annelides are very beautiful, and curling about in the waters of the rocky pool, seem like glittering snakes. Some look like little harmless creatures, but others seem to glance defiance at us as they dart to the other side of the pool, and hide themselves among the sea plants or beneath some silvery shell.

There is one advantage which the sea possesses above any other of the scenes of Nature in this portion of our globe, which is, that its aspect is always beautiful under any change of season. Winter strips our fields and hedgerows of their leaves and flowers; our streams lose their crystal clearness, our meadows their robe of green; and if we linger among the woodlands, admiring the various forms of the leafless boughs, the strange wild attitudes of some, the graceful disposition of others, yet are they so much less lovely than in the time when summer clothed them in their green, or autumn in their gold, that were it not for the music of the winter woods, the strange wild harmonies made by the winds among them, their beauties would not often long detain us in our country walk. But the sea is always beautiful, always musical, in sunniest or darkest day. Now, as it ripples softly on the summer shore, the little surges just falling on the pebbles, and making a sound as gentle as that of an April rain on the forest leaves, it is soothing and calming to the mind. Its con-

tinuous sound lulls us into that state of quietness favourable to meditation and uninterrupted trains of thought. And when the storm-wind sweeps over the sea, and we listen breathlessly to the wild harpings of the waves, the spirit seems awakened too, the thoughts are borne away, and blending themselves with the sublimities of nature, the listener seems awhile to forget in the elevation of the spirit, that there is yet a portion of him which is of the earth and mortal. It is in moments like these, amid the deep yearnings of the soul for something beyond all that the material world can offer, that the poet and the philosopher are first awakened to a new existence. It is at moments like these, and amid the longings for the infinite, that the Christian turns with renewed gratitude to that Holy Record which tells of Life and Immortality.

Never, perhaps, is the sea more lovely than when on some summer evening, after a succession of stormy days, it has become calmed and is lighted up with a glow of phosphorescent brightness; when as the boat glides onwards—

> "Every track
> Is a flash of golden fire."

Every one who has resided for any length of time on the shore, can remember some calm nights of this kind, when the moon shone in silvery lines across the water, and spread its bright gleam over its whole surface, making it look like burnished steel. A wake of light has seemed to follow every boat; and if the hand was dipped into the sea, it brought up glittering sparks which dropped from it. If we ask some mariner how this may be, and

how in the brilliant night scenes of the tropical seas this light shines brighter still, we may perchance be told that the light is caused by the sheathing of the hulk striking fire in consequence of her rapid motion. But the naturalist has a different tale to tell, and he can show how the phosphorescent light is caused by the masses of the dead inhabitants of the deep, by the gleams given out by several crustaceous animals, by zoophytes, by various fishes and animalcules. But most of all is this phosphorescence attributable to the innumerable swarms of jelly-fishes, which in the day time delight us with tints of various hues, and compose

> "The luminous life
> That makes the dark nocturnal ocean bright
> With constellated clusters of rare things,
> Group'd or apart; seeming in lustrous grace
> Fantastic wreaths of many-colour'd gems
> Instinct with living fire:—or here and there,
> Glittering in golden glory:—flashing forth
> Metallic white—or tremulous silver, cinqued
> By ambient tints of sapphire, pink and blue.
> As if some opulent spirit of the sea
> Had, from his treasury of precious stones,
> Flung up his choicest treasures on the waves,
> To bathe their beauties in the meek moonshine."

In our seas these glowworms of the deep belong chiefly to the Medusæ, which, of microscopic minuteness and in inconceivable profusion, swarm in every drop of ocean, while the larger kinds may often be seen gliding near its surface, and lying in multitudes on our shores. In some regions the waters are crowded with myriads of minute jelly-fishes; and in the Red Sea, according to Mr. Salt, they teem in such abundance as to bear a proportion of one third or even one half to a given

volume of the water. The animals of this genus have a disc more or less convex above, similar to that of a mushroom or umbrella, sometimes deepening into the shape of a bell. The greater number cannot be seen in the day time, for they are clear as crystal, and both by their small size and translucent nature often escape the observation, even when aided by a microscope, till night brings out their sparkling beauties. And why were these and the other tribes of beautiful jelly-fishes created? Were they made merely to gratify our sense of beauty and to give us delight as we gazed upon them? The beauty of nature, its fitness of pleasing the intellectual taste of man, was evidently deemed by the great Creator of the universe no mean object of his care: but these animals have other purposes too to fulfil. When God said, "Let there be light" over all the earth, yet he sent no light from the orbs of heaven, into the depths of the sea. Light rapidly diminishes in its progress through the water, and far away down in the deeps all would be darkness but for this provision of rendering it luminous. Yet there is an inconceivable multitude in that world of life beneath the waters. The fishes, which, like the lion of the forest, seek their prey there, and choose for their hunting time the period when man is sleeping, need these lamps to guide their way. Fishes will follow any luminous object, and the angler knows that the glitter even of a newly tinned hook will be an attraction to the herring amid the waves; and thus the smaller animals are caught by means of the glitter arising from the newly dead inhabitant of the deep, which ere it has time to become putrescent glitters with light,

and is carried off for food; while the lamps which shine from countless Medusæ help the fish to chase his living prey. Nor have the tribes of jelly-fish performed all their part in creation when they have lighted up the darkness, and in their turn served as food to other tribes of animals. "Possibly," says Professor Jones, "the sea itself is fitted by their agency to be the residence of beings that otherwise would perish. Not the least striking circumstance in the history of the Rhizostoma (a genus of large jelly-fishes), is its prodigious power of producing, from the surface of its body, quantities of mucus or thick slime, which is of course mixed up with the surrounding water. Whence this material is furnished, is even yet a question; but so copious is the supply, that if a specimen be placed alive in a large vessel filled with water, in a little time the whole is rendered thick and viscid, so that the Rhizostoma would perish speedily from the accumulation of its own secretions. You change the water, but in vain, still the abundant mucus is poured forth, nor does it cease as long as life remains. But if a single specimen afford such quantities of viscid matter, we shall conceive when we reflect upon the countless multitude of Acalephæ, spread through every sea, that their united agency must cause important changes in the water around them, filling it with animal substance, upon which innumerable races may be fed, a kind of nutriment adapted to the feeble mouths of new-hatched spawn, or ocean's tenderest progeny."

The whole tribe of jelly-fishes are included under the name of Acalephæ, the Greek word for a nettle, and they are commonly called Sea-nettles,

and by the French Orties de Mer. This is a very old name for them, for Aristotle called them so, and it was given on account of the stinging property possessed by some of them. They have not all, however, the power of stinging, though all are phosphorescent. Indeed, by far the greater number of the British jelly-fishes may be touched with safety, and Professor Forbes, in his work on the "Naked-eyed Medusæ," mentions four species only as being, in his opinion, gifted with this nettle-like property. Beautiful as are many of the creatures of the sea, none are more lovely than the Acalephs. Now they may be seen in the darkness of night, moving with most graceful ease, like so many resplendent orbs, shining singly, yet gliding from place to place; and now combined in vast multitudes, forming a broad sheet of light. The vessel glides in amongst them, or the oar throws up the white foam, and a shower of stars rises but to fall in a stream of living brightness. Down below the surface these jellies seem like balls of silver or gold; sometimes, as in the Girdle of Venus, of the blue Mediterranean, appearing like a riband of flame, of several feet long; or, as in the yet more luminous Pyrosoma, enabling the voyager to read by their light, as he stands by the cabin-window of the ship. Some of the larger species are described as having the resemblance to white-hot shot, visible at some depth beneath the surface. Our own rocky shores are sometimes studded with them as with diamonds, and many who have trodden on the tuft of sea-weed, have seen it shoot out, in all directions, rays of phosphoric light, which reminded them of a star of artificial firework. So beautiful are they, that the man of science, in

describing them, writes like a poet, and Professor Forbes, speaking of one of these globular umbrella-shaped animals (the *Modeera formosa*), whose tints are white and richest crimson, says of it, "There is not a Medusa in all the ocean which can match for beauty with the minute creature now before us, though its smallness is such, that a split pea would overtop it. Yet small though it be, it has shape, colour, and substance so disposed, that as yet no explorer of the sea has met with another like it. It is gorgeous enough to be the diadem of sea-fairies, and sufficiently graceful to be the nightcap of the tiniest and prettiest of mermaidens." Another very lovely Medusa, not uncommon in the ocean around the Isle of Wight, is as clear as the water itself, and by day time can only be seen by the rich crimson nucleus beneath the crystal mushroom-like figure. This richly tinted portion is very apparent, so that the beautiful Scarlet Cyanea resembles in the water a bead of coral, swimming beneath the calm surface of the sea. Hugh Miller, in his "Summer Rambles," gives an interesting description of some of the common kinds, which he saw while aboard the "Betsey," off the island of Eigg. At this time the Medusæ had risen from the bottom of the waters as the wind fell, and "were mottling the green depths of the water below and around, as far as the eye could reach. Among the commoner kinds," says this writer, "the kind with the four purple rings on the area of its flat bell, which ever vibrates without sound, and the kind with the fringe of dingy brown and the long stinging tails, of which I have sometimes borne from my swimming excursions the nettle-like smart for hours;

there were at least two species of more unusual occurrence." One of them the writer describes as scarcely larger than a shilling, inscribed with a pretty orange-coloured wheel; the other like a small brown hazel nut. "As the evening closed," continues this author, "and the depths beneath presented a dingier and yet dingier green, until at length all had become black, the distinctive colours of the Acalephæ, the purple, the orange, and the brown, faded and disappeared, and the creatures hung out, instead, their pale phosphoric lights, like the lanterns of a fleet, hoisted high to prevent collision in the darkness. Now they gleamed dim and indistinct, as they drifted undisturbed through the upper depths, and now they flamed out bright and green, like beacon torches, as the tide dashed them against the vessel's sides."

All may not have seen our beautiful Medusæ to such advantage, though most persons who have sailed on the sea have met with masses of the larger kind, which seemed moving along in myriads; and all who have rambled on the shore have seen the large gelatinous transparent discs of some, surrounded with a fringe-like margin, dilating and contracting as they swam just below the surface of the water. Not a walk of any extent can be taken along the shore, in summer time, at low tide, but we meet with that species which is the commonest of all the British jelly-fishes, the common Aurelia (*Aurelia aurita*), with a clear bluish gelatinous disc, fringed with thread-like tentacula, often measuring nearly a foot across, and easily described. It has four long arms with fringed edges, coming from the centre of its umbrella-like expansion. Between each pair of arms is a raised

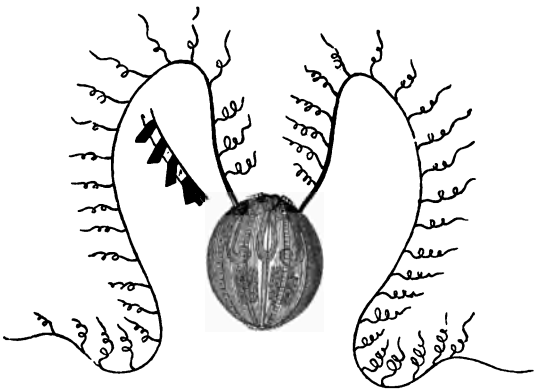
tubercle. These are four in number, and shaped like horse-shoes or half-moons. They are of bright purple colour, and are very conspicuous when we see the jelly-fish swimming in the water. These Medusæ are extremely abundant; sometimes, by their numbers, impeding the course of vessels, and occurring all round our coast. We need not fear to touch them, for they are stingless.

Far different in this respect is the jelly-fish termed the Hairy Cyanea (*Cyanea capillata*), a common animal of our seas, and one which has sent many a bather away with smarting sensations not easily forgotten. It has a dingy brown disc, about a foot across, festooned at the edges, while as it flaps along in the water it drags after it an immense number of filaments, like tails, which constitute the "hair," from which it derives its name. Woe to the bather who, regardless of the approach of this beautiful but terrific creature, becomes entangled in this trailing "hair." To get out of the tangling mass seems impossible, and wound among its meshes, he experiences a prickly torture, until the jelly-fish, finding its own course hindered by the contact, uncoils its arms and leaves the bather free to swim from its embrace. Even when the filaments are cut away, they retain their power of stinging as fiercely as when around the beautiful crystal monster which they once adorned. The Lamarckian Cyanea (*Cyanea Lamarckii*), a less common species, possesses a like power of stinging; and another species is mentioned by Professor Forbes as stinging faintly; but these are all the Medusæ which that scientific naturalist has ascertained as the true nettles of our British seas.

The largest kind of jelly-fish frequent in our seas is the Great Sea-nettle (*Rhizostoma Cuvierii*), the name of root-mouthed having been given to the genus, because the animals composing it were, until recently, believed to have no true mouth, but to receive their nourishment from pores on the eight large peduncles which hang from its centre. Like the other Medusæ, however, it is now thought to have a true mouth. It is sometimes two feet in diameter, and is several pounds in weight. Yet if this large jelly-fish is left on the shore but a few hours only, nothing remains of the mass but a number of small films. The jelly of the living animal is composed entirely of large cells of fragile texture, arranged with exquisite regularity, differing in form in the various species, and filled with a fluid which seems to resemble sea-water. In some species when this evaporates, nothing is left but a stain on the stone where the jelly-fish lay. This, as well as other species, has a great sensibility to light, several of the smaller Medusæ being known to sink into deep water to avoid a bright light. Though it seems doubtful if they are gifted with eyes, they, like some other creatures low in the scale of animal life, appear to be endowed with senses, which give them perception in a manner of which we can form no idea. A writer on this subject records that he once saw a shoal of the Great Sea-nettle of our coasts, swimming high with the tide off Seaton, during calm weather. As these animals approached the boat, over whose side the writer was looking, they gradually sank in the clear glassy sea, and it required some dexterity to catch, with the boat-hook, only one or two of the great numbers which

passed. The slightest motion immediately alarmed them. Every one who, when bathing, has tried to catch a jelly-fish, knows how difficult is the capture, as they glide away from the approaching hand, and were it not that the wave dashes them against us, we should probably rarely succeed in obtaining one. Our common species are termed Sea-blubbers, Sea-dangers, Falling-stars, or Sea-crosses. At Dovor they are very generally called Starch-fishes.

A very beautiful jelly-fish, which in some parts of our coasts is not rare, is the Globular Beroe (*Cydippe pileus*), and it is a more lovely object



under the microscope than can possibly be imagined by those who have not witnessed it. It is of an oval shape, often nearly an inch long, and having eight belts of little plates on its surface, which serve as paddle wheels. These plates con-

sist of a number of fine hairs (cilia), which are placed side by side, like the barbs of a feather. By means of rapid successions of vibratory action caused by these ciliary rows, the animal is propelled through the water with great velocity, the mouth in advance, perpetually contracting and dilating, and communicating with a two-lobed stomach provided with a valve. A complete whirlpool is made around the beroe by the action of the cilia, and the valve in the centre of the animal is left open. This communicates, by another tube, with the opposite pole of the globular animal. No sooner does a small shrimp or other like creature of the waters approach, than it is forced by the current into the mouth. Its hooked claws and fringed arms avail it nothing. The valve is closed upon it, the nutritious part of the victim is dissolved, and in due time the indigestible shell and the eyes are thrown up again in the water. The undigested eyes of the shrimp, seen in the stomach, have been sometimes mistaken for the organs of the beroe. It is generally stated that the long filaments at the side of the beroe, covered with the tendrils, are a means of securing prey. An intelligent naturalist, a friend of the writer's, who has made microscopic observations on this animal taken from the shore of Dovor, is of opinion, that these tentacles serve only as anchors to hold the animal fast to any object to which it may choose to attach itself. Some small shrimps were placed by this gentlemen in a vessel of water, with the beroe; one of these became accidentally entangled, and was dragged, apparently without design on the part of the beroe, into the receptacle of the

tentacles. This part has no connexion with the digestive tube, and is evidently designed solely for the reception of these long arms, when the animal chooses to withdraw them and to remain a simple globe. After some time the tentacles were again protruded, and the shrimp escaped, evidently uninjured. Its mode of catching its prey was by this gentleman, after much observation, deemed to be wholly irrespective of these long filaments, which the beroe appeared to use as cables for keeping itself firm in its position, and by which it held fast even to the smooth surface of a glass vessel.

Like all other jelly-fishes, the substance of the beroe seems but a few filmy cells, filled up with a material like sea-water, which soon dissolves, leaving scarcely any trace of the animal behind. The naturalist just alluded to, having confined one of these animals in a cylindrical glass vessel, observed, that after the lapse of about twelve hours, it appeared to undergo a gradual dissolution of its substance, commencing at the upper pole, around the tube extending from the mouth to the stomach. In a few hours the whole of the upper half of the body had dissolved, leaving the digestive tube standing like an isolated pillar at the centre. Notwithstanding this mutilation, the animal appeared to be as lively as ever, gliding up and down the glass with the same easy and rapid motion. At length the stomach and mouth fell off, and it underwent a gradual reduction of its dimensions, retaining its activity to the last. Finally, the tentacula fell away, and the last trace of the crystal ball of the beroe, which was

to be seen, comprised not more than a fortieth part of its entire substance. To this was attached a portion of one of the ciliary bands, by means of which this fragment of the animal moved rapidly, so long as any remains of it were visible in the water.

The enthusiasm with which observations like these are made and described, is easily partaken by such as have an eye for the beauties and wonders of nature. The utilitarian smiles at such pursuits, and valuing science but as it may contribute to the promotion of wealth or of physical comfort, would deem an hour idly spent in watching the structure of an animal under a microscope. Yet these minute wonders were made by the God who formed the sun and stars, and who inspired the records of Sacred Writ; and if they fix on our minds one fresh idea of his power and goodness, we have not looked on them idly. There are many, too, who receive exquisite enjoyment in such pursuits, and some now pining in sadness, and consumed by the one painful idea of the past or the present, might be cheered, could they but be once awakened to an interest in natural history. The poet could appreciate and describe the feelings belonging to the lover of nature:

"One made acquaintanceship with plants and flowers,
And happy grew by telling all their names;
One class'd the quadrupeds, a third the fowls,
Another found in minerals his joy;
And I have seen a man, a worthy man,
In happy mood conversing with a fly;
And as he through his glass, made by himself,
Beheld its wondrous eye and plumage fine,
From leaping scarce be kept for perfect joy."

The globular beroe is common on many parts of our sea-coast. It has been found at Sheerness, and is by no means unfrequent at Dovor. The fishermen say of it, that it is the spawn of the sea-egg. Some of the species are to be found in most seas, swimming along with great rapidity, by means of their myriads of minute cilia. Like the other acalephs, it is not possible to preserve them for any length of time.

The colour of the Greenland sea, varying from ultra-marine to olive-green, was found by Mr. Scoresby to be caused by the innumerable jelly-fish of the tribe of medusæ which swarm there. These animals are found in the bluish-green water in great profusion, but in the olive-green they are innumerable. Mr. Scoresby calculated that a cubic fathom of this water would contain 23,000,872 individuals; and a cubical mile, 23,888,000,000,000,000. He adds, that allowing even that the depth to which these animals extend be but two hundred and fifty fathoms, the above immense number of one species may occur in the space of two miles square. And in order to give a better idea of the amount of medusæ than the mind can gather by reading statements made in a large number of arithmetical figures, he says: "Allowing that one person could count a million in seven days, which is barely possible, it would have required that eighty thousand persons should have started at the creation of the world, to complete the enumeration at the present time." Twenty or thirty thousand square miles of this sea are thus coloured by the medusæ; how then shall the mind of finite man conceive of the numbers of these living creatures,

formed by their great Creator, and preserved by his constant care!

Lowest in the scale of animal life, yet wondrously constructed as are animals of highest organization, are those singular productions, the Sponges, springing from the marine rocks or sea caverns, or growing down in the waters of ocean, or occasionally clustering in the clear rivulet. As they branch forth from the rocky fissure, resembling plants in their form, ramifying, like them, accord-

ing to local circumstances, having nothing which, at first appearance, would indicate an animal nature, it is not surprising that zoologists deemed them of vegetable origin, or at least regarded them

as forming a link between the animal and vegetable kingdoms. Since the day when that close observer, John Ellis, a merchant of London, made accurate observations on these productions, writers have still varied in their opinions as to their nature, till Dr. Grant satisfactorily proved that the marine sponges, at least, are certainly animals. Dr. Johnston enumerates fifty-six species of British sponge; but these cannot be described merely by their external appearance, as the same species will often assume a great variety of forms. In order to study the sponges, we must look at them under a microscope, and direct our attention to the nature of the framework. Taking a small portion from the common Mediterranean sponge of our toilet tables, and placing it under a microscope, we see that it is composed of a number of elastic horny fibres, crossing each other in all directions, and forming a complete network of meshes, through which the water is absorbed, and passes through every portion of the sponge. Countless pores cover the surface of this network, and hence a current of water goes towards the centre whenever the sponge is dipped in liquid. But besides these minute pores, there are large and distant canals, having larger orifices on prominent portions of the body of the sponge, and during the life of the animal the water is, by means of some vital force, gradually collected into these channels, and forcibly expelled through

the openings, thus making two counter currents.

The living animal of the sponge can, of course, only be seen in the newly-gathered specimen. It consists of a gelatinous, filmy substance, similar to the white of an egg, and varying in quantity in the different species. If a small portion of this be placed under a microscope, it exhibits minute transparent grains; and yet this gelatinous substance, spread out upon the network, the skeleton which itself has made, separates from the sea such substances as shall nourish it, and serve for the fabrication of its own peculiar structure.

The opposing currents of water, during the entire life of the animal, are described by Dr. Grant as most rapid and remarkable. Having brought one of the larger apertures of the Spongia coalita under the microscope, this writer describes it as "a living fountain, vomiting forth from a circular cavity an impetuous torrent of liquid matter, and hurling along, in rapid succession, opaque masses, which it strewed everywhere around;" and after having watched this orifice at short intervals for five hours, sometimes looking at it for a quarter of an hour at a time, the stream was seen still to roll on with a constant and equal velocity. Dr. Grant's description of these fountains in the Spongia panicea is no less striking. "Two entire specimens of this sponge were placed together in a glass of sea-water, with their orifices opposite to each other, at the distance of two inches; they appeared to the naked eye like two living batteries, and soon covered each other with the material they ejected. I placed one of them in a shallow vessel, and just covered its surface and highest orifice with water.

On strewing some powdered chalk on the surface of the water, the currents were visible to a great distance; and on placing some pieces of cork or of dry paper over the apertures, I could perceive them moving by the force of the currents, at the distance of ten feet from the table on which the specimens rested." And thus the wondrous operations of nature, till lately unsuspected, have been continually going on since man first awoke to light and life; the knowledge of which reminds us how much there may be still in the world around us of which as yet we know nothing. Surely the philosopher may well be the humblest of men, since he best knows the degree of man's ignorance and the finite nature of his understanding.

The young eggs or gemmules of the sponge are attached to the inner sides of the canals, and are, when fully formed, clothed with the minute hairs which serve so important a part in the economy of many small marine animals. Here again they are useful in forming currents in the water around them, by means of their rapid and incessant motion, and these currents carry away the young egg of the sponge into the sea, till it fixes itself in some rocky crevice, or on some sea-weed or other object, and springs up like a little tree, or forms itself into a ball or cup, or takes any other form, according to its species and the circumstances under which it grows.

Additional strength is given to the framework of some kinds of sponges, by calcareous or flinty minute crystalline spicula, which, small as they are, are capable of scratching glass. The existence of these in our British sponges, as well as the smaller growth of these productions, render them

unfit for domestic purposes. The sponges with thorny framework belong mostly to the seas of warmer zones, though even our common Turkey sponge may be seen, on reducing it to ashes, to contain a small portion of flint. The forms of the spicula are invariable, and therefore constitute a good characteristic of species.

Our native sponges have not the grotesque shape of the larger kinds belonging to tropical seas, where balls, inverted cups, fans, and mosses seem represented by them as they hang among the fissures of the rock. Yet with us they fringe the rock or sea cave, branching out like trees, or grouping in rugged and irregular crusts, or clasping around the various olive-green sea-plants, or forming a soft carpet on some rocky ledge. Their brown or sandy-coloured branches lie about on the beach, or sometimes we find them, as in the case of the smallest of our native sponges (*Spongia confervicola*), growing among the hair-like green Arctic conferva on the rock, and contrasting its brilliant white colour with the dark green tint of that sea-weed. In some cases, as in a common sponge (*Spongia fluviatilis*), the colour varies from bright green to pale brown, according to the action of light, inducing many naturalists to think, that though marine sponges are undoubtedly of an animal nature, yet the fresh-water sponges may belong to the vegetable kingdom. Many of our native sponges grow within reach of the tide, others down below in the deeper waters, where they become of more compact structure, and are less easily rent by wind or wave.

Our figure will enable the reader to identify one frequent object of our shores, the common

branched sponge (*Halichondria oculata*). It is usually of a pale sand-colour, though sometimes of a darker brown. It varies much in the disposition

of its branches, for sponges differ more than many other marine productions in the form of the individuals of a species. It is frequently to be seen hanging from the under surfaces of the rocks, at about the low-water mark of spring-tides.

Aristotle told of the sponges, that they shrank

when touched. That the Greeks used them as we do for domestic purposes, is evident from their name, which is derived from the Greek word to squeeze. Homer, too, relates how Vulcan obeyed the command of Thetis :

> "First from the forge dislodged, he thrust apart
> His bellows, and his tools collecting all,
> Bestow'd them careful in a silver chest;
> Then all around with a wet sponge he wiped
> His visage and his arms and brawny neck."

To those who love to stray among the wild solitudes of nature,

> "To sit on rocks, to muse o'er flood and fell,"

there is something very delightful in the nooks among the crags at the base of the cliffs. Some little plants that love the saline air, some green patch of grass or bright flower, has found a place on which to spring, and may form a cushion for us on the jutting crag. And there, far away from the haunts of men, the tall white cliff overhanging him and contrasting with the deep blue sky, the wild murmuring of the sea, the strange shrill screams of the sea birds, seem to awaken the echoes of the heart—

> "The universe's inward voices cry
> Amen to either song of joy or woe,"

and the human heart responds alike to the wail or mirth note of nature. The sea-gulls come crowding or singly,—

> "Each on its separate track of life,
> And each a mystery."

We have many species of these birds, and the common gull (*Larus canus*) may be seen cresting

the billow, fearless of storm, or covering, with others of its tribe, the crags of the rocks in countless numbers. The prettiest species is the laughing gull (*Larus ridibundus*), which is common on our coast during winter, but leaves the sea when spring returns, and wings its way inland to build its nest. It is of a beautiful pearly grey colour, changing in the winter season to a white, and its head is of a blackish brown hue. It skims lightly over the water, for like the other gulls it cannot dive, but it feeds on the fishes and other marine animals which come near the surface, or on the insects of the moist inland spot where it builds its nest; and when seen at a distance, looks so like a dove, that we might fancy it a messenger from some ark upon the waters. Tempestuous weather is looked for when the gull flies inland, and Scottish records relate how when flocks of sea-gulls come in from the shore, a storm from the south-east is sure to follow, which being over, they will return to the sea again. The gulls are restless, screaming creatures; their song is doubtless one of joy, and though we might in the woodland deem it harsh and dissonant, yet its wild shrillness seems so adapted to the lonely and rugged places where it is heard, that it has its own music too.

The sea-swallows are graceful creatures, too, and much like our land swallows. The common Tern (*Sterna Hirundo*) skims in great numbers over the waves which wash our southern shores, and its grey wings and black-topped head are a familiar sight. And when storms have been raging, and the "signs and wonders of the elements" have been exhibited, and we can reach the lonely cliff, to see how the ocean, whose fury has been

so great, seems even yet to be foaming with rage, perchance some stormy petrel (*Thalassidroma pelagica*) may be seen darting about over the waters close to the shore, or coming to seek refuge on the cliff. It is common at such times around the coast of England and Scotland, and is a bird something like a swift, with a short compressed bill, and the smallest of all web-footed birds. Large flocks of these petrels often appear far from land, and the mariner, with the superstitious feeling common to those who live in mountainous places, or far away out at sea, or in other lonely regions, looks on them as messengers of the storm, and associates them with all the wild terrors of the tempest, the broken mast, and the shipwrecked vessel, and the drowning sailor. The name of storm-finch has its synonyme in the French *Pétrel Tempête*, and the *Accello delle Tempeste* of the Italians; and the sailors give the bird the name of Mother Carey's chicken, from one who was supposed, in darker times, to be a witch, and, able to raise a storm by her machinations, sent out our little birds as forerunners of evil. That their appearance forebodes a tempest, is often true, but their instinct leads them, in the time of coming danger, to hover in the wake of the vessel, as if, like some other of the lower animals, they relied on the presence of man for safety. Yet even when skies are blue, and the waters are calm as the silvery lake, the petrel follows the ship, sometimes for days, gathering up for its food such refuse as may be thrown from it. Sleepless and untiring, skimming lightly over the water with unfailing wing, and only gently touching its surface, they seem almost to walk upon the sea, and Mr. Yarrell says that its name of petrel was

given to this bird from the apostle Peter, because of this circumstance.

On our northern and western shores vast flocks of those antiquated looking birds, the Puffins, congregate in the spring, and stay till the autumnal winds warn them to depart for the warmer shores of Southern Europe. Venerable birds are they, looking down from the ledges of the lofty cliffs on which they have perched themselves, as if they were moralizing on the follies of mortals below; or keeping their sharp keen eyes fixed on the waters, till some fish appears near the surface, when they dart down and capture their prey. Their allies the Auks, and the Guillemots, called Wild Willies on some of our coasts, also cover some of the cliffs in unnumbered flocks, making such a confused noise, as if quarrelling and screaming, that their shrill cries seem almost to bewilder the wanderer below.

The dark dusky-looking Cormorants may be seen on our southern shores, spreading out their wings to dry their plumage, which, unlike that of many diving birds, gets thoroughly wetted by their plunging under water. Sometimes as we watch this bird, we may see its head emerge from the sea, but it pursues its prey down beneath the surface, and devours it with such voracity, that the proverb, "as greedy as a cormorant," is a familiar one. It is provided by Almighty skill, for the purpose of feeding on larger fishes than can be swallowed by most birds, with a very large gullet or tube, between the mouth and stomach, and it is said even to be able to swallow a flat fish. Its digestion is so rapid, that a tame bird has been known to eat three or four pounds of fish twice in

a day. The cormorants can dive down on their prey from the greatest height with almost unerring certainty, and having seized a fish, will emerge from

the water with the fish across the bill, with sudden twirl throw it up in the air, catch it head foremost, and swallow it.

The black cormorant (*Phalacrocorax carbo*) is a common bird of the shores. It is to be seen in great numbers on the cliffs of the Isle of Wight,

making its sea-weed nests. The Rev. C. A. Johns, in his "Week at the Lizard," describes the cormorant as an unfailing visitor on the rocks in that district. "One low rock in particular, near Pen Olver," says the writer, "has generally on it a conclave of twelve or more birds, solemnly digesting their last meal, or expanding their wings to the sun, while in the water a solitary head at intervals shoots up, jerks itself from side to side, and immediately disappears."

The Gannet or Channel Goose (*Sula alba*) resides constantly on our coast, and has great strength of wing, soaring over the sea, and darting into it with inconceivable rapidity. It is a white bird, with black-tipped wings, the young ones resembling downy balls like powder-puffs. It is of great value to the people of St. Kilda, both for its number of eggs and soft down.

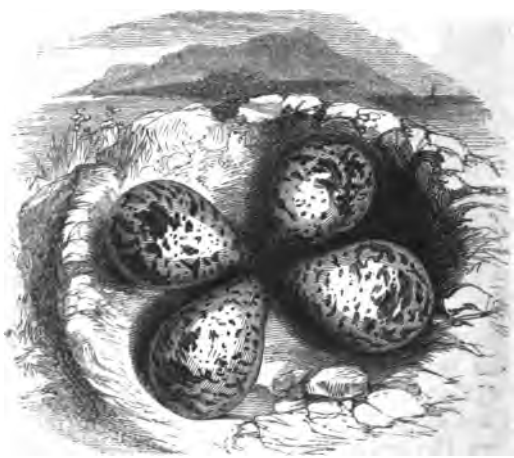
Vast crowds of ducks and geese come to us in the winter months from colder regions, and some make their dwellings on the coast, while others build their nest inland. The loud noise made by a flock of these as they pass in some winter's day over our heads, has a singular sound, and accustomed as we are, from childhood, to deem that the rustling of their wings, tells of coming rough and cold weather, they scarcely receive a welcome. Many, however, can remember when, in their early days, they had the fancies which Clare describes as in the mind of the shepherd boy:

> "He hears the wild geese gabbling o'er his head,
> Then, pleased with fancies in his musings bred,
> He marks the figured forms in which they fly,
> And, pausing, follows with a wondering eye,
> Likening their curious march, in curves or rows,
> To every letter which his memory knows."

The goosander, the smew, and other birds frequent the shore, while grebes and divers dash down into the waters after the fish, and the pied oyster-catcher seats himself on the rocky crag, not so much delighting in the oyster from which it has its name, as in the resistless limpet and the mussel, which have little chance against the attacks of its strong bill. This bird is also called Sea Woodcock and Olive. It is very common on the low flat coasts of our island, its beautiful glossy black wings and back contrasting with the white plumage of its breast and the under portion of its expanded wing. It lays its eggs on the low ground or shingle. They are four in number, of pale olive-green, blotched with white.

The loud solitary whistle of some lone curlew (*Numenius arquatus*) has an almost thrilling sound, as we listen to it at some distance, while the clear shrill tones uttered by the large flocks of curlews, or the notes of "courlie, courlie," which they utter as they sweep around the head of one who approaches their nest, heard when alone on the shore, far from human habitations, are among the wildest of the tones of nature. These birds, as well as the oyster-catcher, belong to the tribe of waders, and are adapted for wading in search of food, by having the greater part of their legs free from feathers. In this tribe, too, we find those joyous little birds the sandpipers, sometimes called Sea Snipes. These birds frequent all parts of our

coast. Troops of the Dunlin (*Tringa variabilis*), which Buffon called the Sea Lark, appear sometimes like a dark cloud, while we see their backs only, but immediately after, all in a moment, as if under the command of some one which all the other birds obey, every individual will turn up at once, and almost dazzle us by a sudden display of the white and silvery under plumage. It is most amusing to watch them as they run along. They seem very types of mirth and sprightliness, moving their tails up and down, and uttering a low gentle note, as they seek their food among the shingle or on the salt marshes near the sea. The dunlin makes a neat little nest, and its eggs, of greenish



grey, tapering at one end and spotted with brown, are always four in number, and are disposed in the

nest in such a form as to take so little room, that the bird may cover them while sitting.

The limits of this little work have allowed but a passing mention of a few of the many birds of our coast, but all have seen them skimming over the sea, or diving into it, and have heard their wild cries. Like all birds, they seem happy creatures, till the fowler comes, with the just right which God has given him over the lower animals, and takes some of them for food, and others for their downy plumage; or till some cruel marksman, who needs them not, and who has no regard for their grace or beauty, aims at them as they are rejoicing in God's sunshine, and leaves their dead bodies to float on the waves, or sends them, with crippled wing, to endure the short remains of life in pain and misery. It would be well could all feel with Cowper's gentle pleadings for kindness to the lower animals, and come to the same result as did the poet in his arguings,—

"The sum is this:
If man's convenience, health, or safety interfere,
His rights and claims are paramount, and must extinguish theirs:
Else they are all, the meanest thing that lives,
As free to live, and to enjoy that life,
As God was free to form them at the first,
Who in his sovereign wisdom made them all."

THE END.

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